INQUIRY INTO SCALING AT

SHOAL ISLAND LOG SORT

as requested by

The Honourable T.M. Waterland

Minister of Forests

on behalf of the

Lieutenant Governor-in-Council

June 17, 1985

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INQUIRY INTO SCALING AT SHOAL ISLAND LOG SORT

The Honourable T.M. Waterland
Minister of Forests on behalf of
The Lieutenant Governor-in-Council

Sir:

Herewith my Report

A. INTRODUCTION

After an exhaustive detailed study into the possible scaling problem at the Shoal Island log sort, I herewith submit my findings:

On April 5, 1984 I was directed by you to estimate the volume of Crown timber, if any, that passed through the Shoal Island sort location between July 1978 and December 1981 and was processed, sold or removed from the Province without first being scaled.

As requested, in order to fulfill this obligation, I have:

1. taken into account Ministry figures and data;

2. afforded the logging Contractors, B.C. Forest Products Ltd. and the Crown on behalf of the B.C. Forest Service ample opportunity to bring forward any information thought to be relevant that might assist;

3. reviewed all relevant available data and have obtained two independent professional opinions on various statistical aspects of the case.

B. CHRONOLOGICAL HISTORY OF THE INQUIRY

1. On April 5, 1984 I was directed by the Minister of Forests, the Honourable T.M. Waterland, to conduct an inquiry into possible scaling deficiencies at the Shoal Island log sort near Crofton, B.C.

2. In June, 1984, I directed Dr. Smith and Dr. Kozak to analyse the statistical aspects of the Thomson, Biickert and Ombudsman Reports. Their report was filed with me on July 9, 1984. (Appendix 1)

3. While coordinating dates for a hearing with the parties involved, various petitions were filed in the British Columbia Supreme Court.

   (a) On April 26, 1984 a Writ of Summons was filed between Kyuquot Logging Ltd. (Plaintiff) and B.C. Forest Products Ltd. and Her Majesty the Queen in right of the Province of British Columbia (Defendant) for breach of contract and negligence arising from the operation of the Shoal Island Dry Land Sort at Crofton, B.C. between 1978 and 1980.

   (b) On July 20, 1984 a petition was filed between B.C.F.P. Ltd. (Petitioner) and Donald T. Grant (Respondent) requesting an interlocutory and permanent order in the nature of prohibition and/or permanent injunction restraining the Respondent from assessing further stumpage and royalty charges and from proceeding with the inquiry.

   (c) On August 2, 1984 a petition was filed between Traer & Mahood Contracting Ltd., John Reid & Associates, White &

Davidson Logging Ltd., G.W. Cox & Sons Ltd., Dougan Logging Ltd., J.R.B. Contractors, Quantum Logging (Petitioners) and Donald T. Grant (Respondent) requesting a declaration that the Respondent has jurisdiction to conduct an inquiry for the purpose of reporting his estimate to the Minister of Forests for and on behalf of the Lieutenant Governor-in-Council. An order directing the Respondent to proceed with the inquiry under Section 87 of the Forest Act.

On August 7, 1984 an Affidavit between B.C.F.P. (Petitioner) and Donald T. Grant (Respondent) to clarify that I was directed by the Minister of Forests on behalf of the Lieutenant Governor-in-Council to conduct an inquiry that is not pursuant to the Inquiry Act. Also that I would not issue any subpoenas to any interested party nor seek to compel their attendence at any hearing.

In addition, that my inquiry is not being conducted pursuant to Section 87 of the Forest Act and/or is it my intention to assess an additional billing for stumpage and royalty pursuant to that section.

(d) The Petitions were argued before the Honourable Mr. Justice Toy on August 10, 1984.

The Judge reserved Judgement and handed down Reasons on August 14, 1984 as follows:

The Judge rejected all arguments of the Petitioners and stated that I was entitled to proceed with the inquiry on the general basis that I not act under the Inquiry Act or under Section 87 of the Forest Act and that I take no

further steps other than to file my report with the Lieutenant Governor-in-Council and not to publish it to anyone else.

(e) On February 27, 1985 the other five Contractors filed a Writ of Summons between Traer & Mahood Contractors Ltd. et al (Plaintiffs) and Her Majesty the Queen in right of the Province of British Columbia (Defendant).

The Plaintiff's claim is for damages against the Defendant, arising from the negligence of the Defendant, her servants or agents, in the operation of the Shoal Island Dry Land Sort facility, near Crofton, British Columbia, and in failing to properly scale timber and logs at such facility between June, 1978, and November, 1981.

4. During August 1984 meetings were held with solicitors of the interested parties to lay ground rules for the hearing.

Counsel representing Traer & Mahood et al was Mr. R.B. Webster, Esq. of Mulholland, Webster.

Counsel for B.C.F.P. Ltd. was Mr. B. Wallace, Esq. and Mr. J.E. Gouge, Esq. of Lawson, Lundell.

Counsel for Kyuquot Logging was Mr. D. Barry Kirkham, Esq. of Owen, Bird.

Representing the B.C. Government Empoyees Union was Mr. G. Heyman, Esq. a member of their executive.

Counsel for the Ministry of Forests was Mr. D.L. Clancy Esq. Ministry of Attorney General, Legal Services Branch.

Inquiry Counsel was Mr. John K. Irving, Esq. of Macaulay, McColl.

5. It was first decided to conduct a hearing with oral evidence but the counsel for the six Contractors took the position that they would not allow their witnesses to be cross examined by other counsel. It was then decided that the hearing would consist of written briefs followed by oral argument. The hearing was held on September 28, 29, 1984 at the International Plaza in North Vancouver, B.C.

6. Each of the parties was given the opportunity to reply to one anothers briefs. A court recorder was present to transcribe all aspects of the oral hearing.

7. At the time of the hearing I decided to obtain an independent assessor to assist me with the statistical aspects of the case. Dr. A.J. Petkau from the U.B.C. Statistics Department was retained. The hearing transcripts and all submissions were sent to Dr. Petkau for review and he filed a report with me on February 7, 1985. The Petkau report was sent to all parties who were requested to make written submissions in reply to his report. All the parties replied and the Contractors submitted additional evidence.

8. I then asked Dr. Petkau to review the additional evidence in the reply of the Contractors and to give me a <u>brief</u> report. This report was received on May 13, 1985 and was circulated to all of the parties. This was done on May 27, 1985 along with new information on check scales carried out during the contentious period.

9. Replies from all parties were received by June 11, 1985 and comments therefrom included in my report.

10. I have decided to make my report brief, but to give my conclusions based on all of the evidence and arguments placed before me. I have spent hundreds of hours going over and weighing all evidence and arguments to the best of my ability.

C. DISCUSSION

1. Reports Reviewed in Detail

(a) T.M. Thomson Report No. I & II of April 1983 and September 21, 1984.

(b) Ombudsman's Report No. 7 of February 1984.

(c) Hutchings' Report to D. Clancy of March 2, 1984.

(d) Whittaker-Burdge Report of March 22, 1984.

(e) Biickert Reports of March 23 & 26, April 2, 1984(*) to A.C. MacPherson.

(f) COFI Report of Task Force on Log Losses (1980 Update).

(g) Smith-Kozak Report of July 9, 1984(*).

(h) Briefs submitted prior to the inquiry;

(i) Kyuquot Logging Ltd. September 24, 1984

(ii) Traer and Mahood Contractors Ltd. September 28, 1984

(iii) B.C. Forest Products Ltd. September 24, 1984

(iv) Ministry of Forests September 24, 1984

(v) B.C. Government Employee's Union September 27, 1984

(i) Responses submitted at the inquiry on behalf of;
  (i) Traer and Mahood Contractors Ltd. et al
  (ii) Ministry of Forests
  (iii) B.C. Forest Products Ltd. (including graphs)

(j) Minutes of the oral inquiry held at the International Plaza, North Vancouver, B.C. on September 28 and 29, 1985 (203 pages).

(k) Dr. A.J. Petkau's Report I (statistical aspect of arguments by all parties) February 7, 1985 (89 pages).(*)

(l) Submissions in reply to the Petkau report and rebuttals.

(m) Dr. Petkau's Report II (reply to remarks and submissions) May 13, 1985.(*)

(n) Whittaker information from Al Moody, the Regional Scaling Coordinator, regarding check scales during the contentious period.(*)

(o) Replies from the Contractors and B.C. Forest Products Ltd. regarding the Whittaker information and the second Petkau report.(*)

(p) In addition to the above, hundreds of documents, memos and letters were reviewed.

(*) Reports included in Appendices. All other reports & briefs are available but not included in this package.

2. List of Estimated Volume Variations

	Volume Shortfall in Percent	
(a) Contractors		
Kyuquot Logging	14.1	
Traer & Mahood	12.4	
John Reid & Assoc.	6.7	
White & Davidson	8.5	
G. W. Cox & Sons	19.3	
Dougan Logging	13.8	
Contractors Average =	13.7	
(b) Diary note from I. McGraw check scale December 10, 1980	(-4.5)	(overscale during contentious period)
(c) I. McGraw check scale of December 11, 1980	(-16.3)	(overscale during contentious period)
(d) Smith-Kozak Report	0.32	Appendix 1 (Biickert confirmed delete test 4)
(e) Forest Service Official Scalers & Shadforth-Woodrow check scale	6.4	September 1-4, 1981
(f) Shadforth check scale - F.S. check & F.S. official	3.6	September 21-25, 1981
(g) F.S. official, - F.S. check scalers	1.1	October 5-9, 1981
(h) Whittaker-Burdge	8.7	(120 working period bundle scale comparison)

(i)	F.S. official - Delta, Tilbury (B.C.F.P.)	1.3
(j)	Biickert Report Average =	3.67
(h)	Check scale S & R adjustment September and October 1981	3.3

3. Comments Regarding Points of Conflict

The variety of shortfall estimates in Section 2 above, comments in paragraphs 6 & 7 of the Smith-Kozak report of July 9, 1984 and a vast array of statistics produced at the two day inquiry hearing in September 1984 prompted the hiring of Dr. A.J. Petkau from the Statistics Department at U.B.C.

Dr. Petkau's reports (Appendix 2 & 3) suggest using the Shadforth, Woodrow, F.S. check scales of September 1-4, 1981 as the best information, if any, for assessment purposes. It is my conclusion that this small sample could not be used to determine volumes throughout the three year contentious period. The check scale and diary note (Appendix 4) during this period plus the Hutchings report of August 21, 1984 on accuracy of scale bears this out. There were many under and overscales during this three yea. period.

Variance of check scales is documented in Hutchings report of August 21, 1984 to D. Clancy of Legal Services Branch. This report shows check and rescales to the Scaling Advisory Committee with less than 25% within the $\pm$ 3% acceptable limit as per the regulation. In one instance of 18 check scales only 5

were within limits and ranged from an underscale of 3.6% to an overscale of 20.7%. This latter example was considered 'Within the ball park" by the Contractors.

Forest Service official check scales at Shoal Island subsequent to the October 26, 1981 change in procedure show a range of variance from 9.4% underscale to 31.3% overscale.

The Contractors demand that we use yearly truck load averaging for volume estimates for the total time period July 1978 to October 26, 1981. In order to comply with this I must first agree that no official scale took place during this period on which to base our stumpage and royalty accounts. However, official scalers, both transient and resident, did officially scale all production at the Shoal Island sort. No one disputes the accuracy of the scalers or denies they were doing a competent job during the three year period.

I do not believe that the Forest Service official scalers were any less accurate in scaling at this sort or any other sort than the Shadforth and Woodrow scalers. It is recognized, however, that the Forest Service scalers were scaling by sort code and under more pressure than the private scalers and logs could be missed.

Although the pace at Shoal was swift the Forest Service scaling supervisors felt that the number of scalers was sufficient to adequately handle the job. Simply misreading the sort code could result in an official scaler missing a log or even double scaling one log which another official scaler had scaled previously to the correct sort. The Ministry of Forests' brief concludes that variations in piece count do not necessarily lead to identifiable variations in volume. The reverse is also true

as shown in the check scale in Appendix 4 where the piece count varied by one log and the volume varied by 16.35%. This happens despite the fact that the scalers knew they were being checked very shortly after they started scaling for the day. However, this is little different than the procedure in isolated camps where scaling supervisors notify the company that they are flying in to camp and require accommodation. The resident or transient official scalers know they are going to be checked the next day.

Scaling is not an exact measurement but it is the best measurement on which to base our stumpage and royalty billing procedures.

It is true that in day to day scaling logs are missed and logs are double counted through human error at any given point in time. Evidence of this is obvious in the large variation in check scale information prior to, subsequent, and during the Shoal Island controversial period as mentioned above.

Truck load averages are useful as an estimate at any given point in time but are not in the least accurate for cut control or billing purposes. When a coastal log spill occurs there is usually no information available for estimating the loss other than camp run estimates or truck load averages. In these cases, Section 87 of the Forest Act is invoked and estimates of truck load averaging are used. This is not to say that this system is as accurate as an official scale but it is used because there is nothing else. It is the best information for an estimate of volume for the small percentage loss.

Variation in bundle size is self evident throughout the reports and will be discussed later.

All the variable factors such as mentioned in the Biickert, Hutchings, Smith-Kozak, etc. reports are factors that create these variations in bundle size including the forest profile. From my experience I cannot justify totally discounting these variables by simply stating that they cancel one another out.

A second scale under Part 6 could have been carried out, but with great difficulty. A separate area would have been necessary to have the logs set aside for the rescale or second scale of the same logs. Operations would definitely have slowed and production disrupted. This problem was of course corrected by the revised procedures on October 26, 1981.

It is still a mystery as to why none of the Contractors noticed any difference in their scaled volumes for over three years if such a large shortfall really did exist. Nothing was ever brought to the attention of the Forest Service until August of 1981.

The assumption that 6% of the total volume of logs leaving the dumps of the various camps were lost due to sinkage is not supported by the COFI Task Force Report on log losses (Update 1980). This report shows that only 3.1% is the average loss by straight flat rafting, with water sort and bundle boom having a 1.45% average loss. Therefore, to assume that all production delivered prior to Shoal Island contained a 6% average sinkage factor is completely erroneous. Prior to the start up of Shoal Island log losses through sinkage had already decreased drastically from earlier years. The COFI report shows log losses decreased 38% from 1973 to 1980 and at July 1980 the total loss due to sinkage of all Coast production was estimated at 1.81%.

Therefore, it is my opinion that the use of the 6% sinkage factor cannot be used in any calculations for determining yearly truck load average.

4. The Shadforth Scales

During May, June and July of 1981 Traer & Mahood contracted Shadforth Log Scaling Ltd. to check truck size bundles by scaling a random selection of load bundles. It was subsequently claimed by the Contractors that these scales showed an 11% underscale as compared to the official Forest Service scalers and tried to substantiate their argument that this situation carried on during the previous three years. There is much mention of the May to July 1981 Shadforth scales throughout most of the reports, particularly the Ombudsman where he referred to Mr. Shadforth on page 7. 'Traer and Mahood had received their first scale returns in April 1981. In May they hired an independent scaler to check the Ministry's scaling of the timber they had harvested. The independent scaler undertook this work without the knowledge of either B.C.F.P. or the Ministry scalers. During May, June and July he examined 37 bundles of logs, and found the Ministry scale to be 11% lower than his calculation of the volume." Until the replies to Petkau's first report produced additional evidence from the Contractors no one knew what method Shadforth had used.

Shadforth's scales of July 9-10, 1981 were not check scales at all since they did not scale the same logs as the Forest Service scalers at the same time. Shadforth was checking bundle volumes of specific bundles for checking truck sizes as instructed by the contractor.

After reviewing this new evidence I must conclude that no inference can be made about shortfall using this data. Forest Service scalers were scaling by sort code on a continuous row of logs while Shadforth scaled selected bundles to determine the load average of two truck sizes in use. There is no possibility of a direct comparison in scale since different logs were scaled and recorded at different times for different purposes.

The Ombudsman's statements in this instance are not based on fact and cannot be used as a basis for calculating an 11% shortfall.

One factor that the Shadforth scales do show is the wide variation in load sizes from both small and large trucks (20% for large and 35% for small trucks).

D. COMMENTS ON STATISTICIAN REPORTS

1. Smith-Kozak Report July 9, 1984 (Appendix 1)

Since stumpage and royalty are billed by volume Dr. H. Smith and Dr. A. Kozak concentrated their report on comparing volumes scaled by the various parties. In order to arrive at a shortfall in scale volume of 0.32% and piece counts by 2.55% they used all the information from four out of five tests used in Biickert's report to Mr. A.C. MacPherson of April 2, 1984. (Appendix 5) They excluded test number 4 (Whittaker-Burdge 120 day bundle scale comparison) because of the large variation in bundle size and because of possible differences in scale.

The analysis of some four booms from Knight Inlet showed a large standard error of the mean and as they state, "Obviously, use of

bundle averages could make a great deal of variation. Piece counts accounted for 2.3 to 85.2% of the variation in scaled volume per bundle. Among the "full" bundles, piece counts ranged from 19 to 130 and scaled volumes ranged from 31.5 to 106.5 m^3 per bundle."

Both Smith and Kozak felt that many assumptions and ratio estimating procedures were used that could not be checked but that the general average shortfall of 13.7% was probably a substantial overestimate.

2. Petkau Reports February 7, 1985 and May 13, 1985 (Appendix 2 & 3)

Dr. Petkau's review of the T.M. Thomson report states that many assumptions have to be made if these statistics are to be believed. To infer that consistent truck load averages would have been experienced during the contentious period July 1978 to October 26, 1981, except for inaccurate scaling, requires the incredible assumption that all other factors, such as species mix, size of bundles, and etc. had no net effect on yearly load averages.

Regarding schedule III of the Thomson report (Table showing 1982 scaling of 1,161 S loads inclusive of boom sticks) where the confidence level of truck load average as scaled by the Forest Service after scaling procedures were corrected, his comments in brief are as follows: "The arithmetic mean is correct, but it is unclear how the reported variance and standard deviation have been calculated. It appears they have been calculated by pretending that the 1,161 loads consist of 153 loads with scaled volumes of exactly 55.94 m^3, 148 loads with scaled volumes of exactly 55.98 m^3, etc.; this would lead to a variance of 5.62 cm and a standard deviation of 2.34 cm. Such a calculation

is completely inappropriate, however, since it ignores the variability between loads within the different groups. The result is that the reported standard deviation of 2.225 cm. greatly understates the actual extent to which the scaled volumes corresponding to individual loads vary from load to load." This leads us back to the first paragraph regarding assumptions and I also find it incredible that all other factors could be waived.

He goes on to state that "even if the reported standard deviation was correct, this calculation is completely inappropriate." His reasoning here is that the 1,161 S loads are a convenience sample, not random, and he knowns of no method to evaluate the standard error of a sample mean based on a convenience sample.

Regarding the 95% confidence limits as the arithmetic mean $\pm$ 1.96 x standard error of mean 99% confidence limits as arithmetic mean $\pm$ 2.58 x standard deviation error of mean he has this to say. "Since the reported standard error of mean has no meaning, these confidence limits are also completely meaningless. Note that even if these confidence limits were meaningful, they are completely incorrectly interpreted." I agree with his conclusions on these points.

Dr. Petkau sums up his remarks on the Thomson report by making comments on the limitations of available data, arbitrary inputs to calculations, such as, the 6% adjustment for sinkage and values used as "truck end areas". In order for this information to be used accurately it must be assumed that the yearly average truck load volumes for each Contractor remain constant throughout. Finally he says "Yet, the available data for the period in dispute is somewhat limited for most of the

Contractors, sometimes of questionable quality, and not entirely convincing."

Dr. Petkau could find no direct evidence concerning the reliability of the estimating system during the disputed period of Kyuquot Logging.

Traer & Mahood Contractors Ltd. et al submitted a report from Crawford E. Laing which used a "CEL Factor" defined as the average volume carried for each square foot of cross section between the bunks of the trucks used to haul the loads. The CEL factor for a Contractor using a single size of truck in a given period is the average truck load volume for the period divided by the cross section between the bunks of the size of truck being used. The premise being that truck load averages and CEL factors are closely related.

Mr. Laing asserted that his factors were identical for all Contractors using high stake truck loading except for the adjustment for cedar content. He claimed that different personnel, procedures or equipment used by different Contractors had no effect on his CEL factors. Mr. Laing went to great length to prove that his method to evaluate volume shortfall is statistically accurate and reliable and the only method available for accurately calculating the shortfall.

Dr. Petkau has the same criticisms of the CEL factors as apply to the Thomson report. He finds that the standard deviation isincorrectly calculated and greatly understated. He states "Rough calculations suggest the actual standard deviation could easily be four times as large as the reported values . . . a basic result of probability theory which applies only in very particular circumstances has been inappropriately applied to

obtain the standard error of the mean for each of the data sets and the standard error of the mean has been used to report confidence intervals which are completely meaningless; since these calculations have little meaning, conclusions which follow from them are not supported. In particular, the statement that the average volume per square foot of cross section is also statistically reliable, with a 95% probability of being within 1% of the mean is not supported by these calculations . . . this report does not justify the claim that the method is statistically accurate and reliable." I find no reason to dispute his statements on this point.

He also found that the data supporting an increased percentage of cedar was very limited and yet this data was used to obtain CEL Factors for all Contractors using high stake loading in any time period.

The Contractors brief insists that every trip is a fully loaded truck. The only information provided on this consistent remark is the incorrectly calculated standard deviations and as such do not state the wide degree of variability. I supplied Dr. Petkau with additional information from Forest Service records (attached to first Petkau report) of scaled volumes for the individual loads corresponding to one of the booms summarized in the Crawford E. Laing report . Using this information he found that there was considerably more variability than suggested in the standard deviation of 4.5 cm. for the data used. He then estimated that the standard deviation for the entire set of 316 L loads would be about 14.0 cm. which is more than three times higher than that reported by the Contractors. As a rule we use two standard deviations from the mean which would result in a load variation of ±28 cm.

The Contractors attempted to compare timber cruising volume sampling and the procedure for evaluating the CEL Factor for the truck loads of timber removed from that region. It is the random sampling mechanism that allows the cruiser to estimate volumes within acceptable limits. Dr. Petkau states that 'Without strong assumptions, it is not possible to use this data to make a statistical inference about the total timber volume in other regions, or in the same region at some other point in time." He further points out that "If the trucks are all of the same cross section, the CEL Factor is simply the load average divided by this cross section. Since the data for all units of the population (the set of truck loads from this region) is available, this calculated CEL Factor is exactly the CEL Factor for the population. No estimation is being carried out, no assessment of precision of the CEL Factor is particular to this population (this set of truck loads); there is no particular reason to expect the same CEL Factors to apply to other populations."

Aside from some similarity in sampling, scaling is the process of measuring logs with cut or broken ends on the ground or in the water. Timber cruising is measuring the standing tree and estimating decay and/or defects from the ground without benefit of a freshly cut face (where decay can easily be detected and estimated).

The Contractor's rebuttal to the first Petkau report was quite extensive, being several hundred pages of mostly tabular information and statistics. Crawford E. Laing came up with a different set of calculations as assessments of the level of variation. He calls this factor SYTLAV (Standardized Yearly Truck Load Average Volume) and uses the term SYTLAV/CEL Factor throughout his second report. He presented different

calculations as assessments of the level of variation in the truck load average volume from boom to boom in which the booms are considered basic entities. The standard deviation derived indicates the amount of variability inthe SYTLAV/CEL observations on seven booms selected.

Dr. Petkau states "As was the case in both Schedule III of the Thomson Report and the earlier Crawford E. Laing report, the major difficulty with these calculations arises at the next step where a standard error of mean is reported. As noted . . . (previously), the calculation leading to this quantity . . . is appropriate only in the case where the set of observations corresponds to a simple random sample drawn with replacement from a particular population. The different sets of observations in Tables A through W of Appendix A (Crawford E. Laing report) clearly do not correspond to simple random samples and I can see no convincing argument that these different sets of observations can be considered as if they did correspond to simple random samples. Certainly they can be thought of as samples from a larger population but not <u>simple random samples</u>! As before, the reported 'standard error of mean' and, therefore, the confidence limits which follow have no meaning." I have no reason to refute his remarks on this point either.

An important point is brought out again in his reference to the Hutchings report where Hutchings asked the question of "Why are the company operations underscaled less than the Contractors?" (Contractors 15.9% underscale and company production virtually nil). None of the participants have answered this question to any degree of satisfaction. It leaves doubt in my mind that such a situation could be possible. The number and variety of scalers working at Shoal Island (Appendix 6) completely

eliminates any possibility of preferential treatment. The scalers seldom knew what contractor or company operation they were scaling for at any particular time.

In brief, both Petkau reports refute the basic theory supported by the Contractors that truck load averages can be used to compute reliable volumes missed, if any, during scaling at Shoal Island during the contentious period. There is no evidence to support the Contractors in their belief and I must conclude that Dr. Petkau is correct in his submissions.

E. FINAL SUBMISSION OF CONTRACTORS (received June 11, 1985 in reply to Dr. Petkau's second report)

There appears to be little new material in either the Contractors final comments or from Mr. Laing's report in Appendix A enclosed with the comments. It appears to me that the same argument is used but in a slightly more elaborate manner. I am still not in the least convinced that yearly truck load averaging can be used in place of known Forest Service official scales, except where no other information is available.

As stated in the discussion of the statistician's reports there is no evidence on which I can accurately rely or calculate a shortfall of volume by using the annual truck load averaging system. Therefore, I must accept the fact that the offical Forest Service scalers used due diligence and accuracy in scaling all the production from both company and contractor operations at Shoal Island during the period July 1978 and October 26, 1981.

F. CONCLUSION AND RECOMMENDATION

It is my professional opinion that any volume of Crown timber, that passed through the Shoal Island sort during the period July 1, 1978 to October 26, 1981 and was processed, sold, or removed from the Province without first being scaled was within the 3% acceptable limits as per the regulation. Through this investigation, I find there is not sufficient evidence to prove discrepancies outside these limits and I therefore recommend that the scales as billed be accepted as correct and no further adjustments to accounts take place.

Donald T. Grant, R.P.F.
Regional Manager
Vancouver Forest Region

4689 Macdonald St.,
Vancouver, B. C.,
V6L 2P5,
July 9, 1984.

Mr. D. T. Grant,
Regional Manager, MOF,
4595 Canada Way,
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V5G 4L9.

Personal and Confidential

Dear Don:

As requested we have reviewed the reports you provided on scale discrepancies at the Shoal Island dryland sort and additional information made available by Mr. H. J. Whittaker. You wanted an evaluation of the content of the reports and an estimate of the confidence limits that could be applied to the various estimates made.

The 1983 T. M. Thomson report (R8307) has made a strong indirect case showing that there was a problem. The methods used were ingenious and probably the best that could be used under difficult circumstances. However, those estimates involve ratios which have an unknown variation and complex error systems which probably could not be evaluated further without a great deal of work. There also is no way of knowing now how those estimates were affected by species mix, cutting permit, season, percentage defect, grades, lengths, truck size, bundling methods, and sizes of loads sought by the dryland sort staff. The estimates made by number of truck loads and average bunk areas showed that something was wrong (since corrected) but offered little "proof" of the size of the problem. Application of conventional statistical methods to the complex situation described in Schedule II of the Thomson report has ignored the considerable variation within booms and underestimated the limits within which the estimates would fall by chance.

The K. A. Friedmann report of Feb. 16, 1984 outlined the circumstances and made four recommendations on page 25, which we assume you are implementing as instructed by the Minister. However, it may still be arguable that the "timber" involved actually has been scaled under Part 6 of the Act and that Section 87 does not apply directly. Obviously, some <u>logs</u> were missed but the <u>timber</u> (means trees, whether standing, fallen, living, dead, limbed, bucked, or peeled) had been scaled as required under Part 6.

Three memoranda by J. A. Biickert (March 23 and 26 and April 2, 1984) to A. C. MacPherson presumably summarized the views of the Ministry at that time. The April 2 memorandum consolidated significant data collected to evaluate Shoal Island. On the basis of five tests, it compared piece counts and scaled volume estimates made by Ministry Official Scalers with those made by other parties. It concluded that 2.9% of the pieces had been missed by Ministry Official Scalers and that Official Scalers had underestimated scaled volume by 3.67%, assuming that tests and participants ought to have equal weight. An alternative, and we believe superior, interpretation shows that other scalers counted a total of 67,157 logs, 2.55% more than the 65,486 counted by the Ministry Official Scalers. Biickert's Table 2 showed that test volumes exceeded volume estimates by Ministry Official Scalers by 3.67%. His method assigned equal weight to each test and included a comparison of 1982 with 1981 average bundle size. Because stumpage and Royalty are billed by volume, we believe that the appropriate comparison should be based on the volume directly. Then we have 98,083.15 m^3 estimated by the test scalers for comparison with the 97,773.7 m^3 estimated by the Ministry Official Scalers, which gives a difference of 0.32%. Alternatively, we could use each of the individual scale estimates from the tests to determine that the gross test volume (119,792) was 1.10% greater than the

gross base volume (118,487.4 m^3). We have excluded test No. 4 which stated average bundle size because it could change for many of the reasons mentioned above in addition to differences in scale.

Just excluding the comparison of average bundle size from Biickert's Table 2 brings the average of the individual tests to 102.72 which falls below the 103.00 level at which the Ministry might be expected to issue a correction to its first bill for stumpage and Royalty.

This experience makes it obvious that scaling involves many judgements and requires careful controls to ensure an acceptable degree of accuracy and precision. You can gain some idea of the variation in the scaling system by considering results of our analyses of four booms from Knight Inlet that were scaled 82-06-30 at Shoal Island. The official bundle count at Shoal Island can vary from the number of bundles recorded on the scale summary sheets because bundles break and logs drop out from the bundles. We used the "full" bundles to show that average bundle sizes were similar in the four booms; they ranged from 70.62 to 75.32 and averaged 73.38 m^3 per bundle. The combined average for 177 bundles had a standard error of the mean bundle volume of 1.98 m^3, or $\pm$2.7%. However, the two cutting permits from which the bundles came have quite different variation. The mean of 132 bundles from 17/7 was 76.97 m^3 with a standard error of the mean of 1.73 or $\pm$ 2.25%. The mean of 45 bundles from 17/10 was 63.55 m^3 with a standard error of the mean of 9.40 m^3 or $\pm$ 14.79%. Obviously, use of bundle averages could mask a great deal of variation. Piece counts accounted for 2.3 to 85.2% of the variation in scaled volume per bundle. Among the "full" bundles, piece counts ranged from 19 to 130 and scaled volumes ranged from 31.5 to 106.5 m^3 per bundle. It seems reasonable that an underestimate of piece count by 2.55% would be associated with an underestimate of volume by 0.32% because we understand that small logs are more likely to have been missed.

Without knowledge of the sources of variation in bundle size, and lacking sound procedures to determine the confidence limits that can be assigned to the ratio estimates used, it is impossible now to reconstruct the actual extent of any "malfunctions" in the scaling system. Therefore, we are unable to confirm or deny the volume shortfall estimated by the 1983 T. M. Thomson report. Its contractor averages of 6.7 to 19.3% and general average shortfall of 13.7% involve many assumptions and ratio estimating procedures that we cannot check, but it probably is a substantial overestimate. Without the basic data used by the consultants to demonstrate the complex statistical techniques that should have been used to make these estimate, we cannot say more. However, we believe that any further statistical analyses at this time would involve more work than may be justifiable at this late date.

From the information that you sent us, we conclude that the tests summarized by Biickert are most useful. The piece counts probably were underestimated by 2.55% and volumes were underestimated by 0.32% by the Ministry Official Scalers. Alternatively, using each check scale made, piece counts probably were underestimated by 2.56% and volumes were underestimated by 1.10%.

Let us know if you have any questions on this letter or require further analyses.

Yours sincerely,

A. Kozak, Ph. D.

H. G. Smith

H. Harry G. Smith, Ph. D., R. P. F.

REVIEW OF DOCUMENTS

RELATING TO THE INQUIRY INTO

LOG SCALING AT SHOAL ISLAND

SUBMITTED TO: D.T. Grant, R.P.F.
Regional Manager
Ministry of Forests

SUBMITTED BY:

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DATED: February 7, 1985

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I. INTRODUCTION

As a professional statistician, I have been asked by Mr. Donald T. Grant, Regional Manager, Ministry of Forests to evaluate the statistical aspects of the arguments put forward by all parties to the inquiry of September 28 and 29, 1984 into log scaling at Shoal Island. To this end, I have reviewed the following documents supplied to me by Mr. Grant:

A. the Thomson report of April, 1983,

B. the Ombudsman's report of February, 1984,

C. the briefs submitted prior to the inquiry on behalf of:
   (i) Kyuquot Logging Ltd.,
   (ii) Traer & Mahood Contractors Ltd. et al,
   (iii) Ministry of Forests,
   (iv) British Columbia Forest Products Ltd.,
   (v) B.C. Government Employee's Union,

D. the responses submitted at the inquiry on behalf of:
   (i) Traer & Mahood Contractors Ltd. et al,
   (ii) Ministry of Forests,
   (iii) British Columbia Forest Products Ltd. (including graphs),

E. the minutes of the inquiry of September 28 and 29, 1984,

F. the letter of D.B. Kirkham of October 30, 1984.

Extensive comments concerning each of these documents are presented in the next section of this report. The main aspects addressed concern the availability of relevent data, the apparent quality and relevance of data presented, the accuracy and relevance of calculations performed on the data, and the appropriateness of conclusions drawn. An overall summary is presented in the final section of the report, together with the conclusions that appear to be supported by the quantitative evidence presented.

II. REVIEW OF DOCUMENTS

A. Thomson Report

A preliminary version of the basic argument put forward by Traer & Mahood Contractors Ltd. et al appears in this report. In brief, for each contractor separately, yearly "truck load averages" are determined and the apparent low levels of these "truck load averages" during the period in dispute (from the start-up of Shoal Island in July 1978 until October 26, 1981 when the scaling procedures were altered) relative to their levels in the previous and/or subsequent periods is interpreted as evidence of underscale during the period in dispute. A weighted average of the "truck load averages" from the previous and/or subsequent periods is then used to impute what the scaled volume should have been during the period in dispute; comparison to the actual scaled volume yields the imputed volume of underscale. The main complication arising in the calculations is due to the fact that some contractors used trucks of more than one size.

This imputation of the underscale volume depends critically upon:

(a) the assertion that the actual yearly average truck load volumes (for a given contractor with trucks of a particular size) remained essentially constant throughout,

(b) the assumption that the scaled volumes both prior to the start-up of Shoal Island and subsequent to the change in scaling procedures on October 26, 1981 are accurate,

(c) the assumption that a 6% increase to volumes scaled prior to the start-up of Shoal Island is appropriate for the determination of yearly truck load averages,

(d) the availability of accurate data to allow the determination of yearly truck load averages.

Since nothing is possible without the relevant data, the primary consideration must be the availability and accuracy of the data required for the determination of yearly truck load averages.

To evaluate the desired yearly truck load averages, the appropriate data for each contractor in each year would be the number of loads delivered and the corresponding scaled volume for each size of truck separately. This would allow the determination of yearly truck load averages for each size of truck separately and would eliminate entirely the need for conversions based on "end area". In addition, the data for loads scaled prior to and subsequent to the start-up of Shoal Island (July 1978) should be available separately, as should the data for loads scaled prior to and subsequent to the change of scaling procedures on October 26, 1981.

Unfortunately, such a simple breakdown of the data does not appear to be available. As I understand it, prior to October 26, 1981, the only data available would be the Ministry of Forests' records of the scaled volume on a boom-by-boom basis and whatever records the contractor may have kept concerning the number of loads of each size making up the boom. The report makes it clear that the latter records were sometimes of poor quality. In the case of White & Davidson Logging Ltd. (Appendix D of the report), for example, the number of loads for many of the 1978 booms and some of the 1979 booms was imputed from the scaled volumes by assuming the individual loads had volumes of 20 cunits (56.63 c.m.). Had a number different from 20 been employed, different values would have resulted for the total number of loads reported in both 1978 and 1979, and consequently also for the corresponding yearly load averages. Such synthetically constructed data cannot be used with any confidence. The basic difficulty is that there appears to be no independent source against which these records can be checked. Yet, these counts of numbers of loads of each size are critical to the imputation carried out in the report of the underscale volume for each contractor.

Since scaled volumes are not available for each size of truck separately, the report resorts to conversions based on "end area" in order to impute the scaled volume delivered by each size of truck, thereby allowing the determination of an imputed yearly truck load average for each size of truck. Provided all trucks are of the same length, the basic idea is not unreasonable, but disagreement might arise over what values to use for the "end area" of trucks of each size. It is not clear how the "end area" values used in the report have been obtained. On page 4 of the report, for example, a large truck with stake height = 8 feet, bunk width = 13.83 feet and "average height" = 8.4 feet is assigned "end area" = 116.5 $feet^2$, while a small truck with stake height = 7 feet, bunk width = 9.66 feet and "average height" = 7.8 feet is assigned "end area" = 75.3 $feet^2$. If "end area" is obtained by evaluating the area of a rectangle with base = bunk width and height = "average height", then the "end area" values would be 116.2 $feet^2$ (13.83 x 8.4 = 116.172) and 75.3 $feet^2$ (9.66 x 7.8 = 75.348) respectively. Is this simply a calculation error, or was some other calculation carried out? Are there only two sizes of trucks with exactly these dimensions? How is the value of "average height" determined? Are the heights of loads actually measured, or are these figures simply guesses? Is it reasonable that a small truck should have "average height" 0.8 feet above the stake height while the corresponding figure for a large truck is 0.4 feet? The report simply states that these values were 'provided by Traer & Mahood Contractors Ltd.' (page 3). The calculation differs for G.W. Cox & Sons Ltd., where 'no information was available on the average height of the loads' and 'end area was calculated using the inside dimension of the bunk and the stake heights as provided by the contractor' (page 13). Given the nature of the available data, this may be the best that is possible with this approach, but its limitations need to be clearly understood. The use of different values for these apparently somewhat arbitrary "end areas" would result in different imputed yearly load averages for each size of truck.

Turning from consideration of the availability of accurate data to the other critical aspects of the imputation carried out, the report attempts to justify the 6% adjustment for sinkage to volumes scaled prior to the start-up of Shoal Island simply by stating that 'it is an accepted fact in the forest industry that the operation of a dryland results in an increase in scaled volume of approximately 6%' (page 8); no evidence is provided to support this contention. Related to this is the implicit assumption that scaled volumes prior to the start-up of Shoal Island are accurate (by this I mean not only that a rescale would lead to a similar scaled volume, but also that the scaled volume is close to the actual volume). A skeptic might argue that there could have been a consistent overscale prior to the start-up of Shoal Island and, if actual truck load averages remained constant, the anticipated increase in scaled volumes due to reduction or elimination of sinkage might not have materialized simply because the new scaling procedures led to a compensating reduction or elimination of this consistent overscale.

The key to the imputation, however, is the assertion that the actual yearly average truck load volumes remained essentially constant throughout. Provided that both the yearly truck load averages for the periods prior to the start-up of Shoal Island and subsequent to the change in scaling procedures and the counts of loads for the period in dispute are correct, the assertion leads immediately to an evaluation of what the scaled volume should have been during the period in question. Even if some doubts existed concerning the accuracy of some of the supporting data, provided this assertion was accepted, one would undoubtedly be led to the method employed in the report (or some minor variation) to carry out the imputation.

The critical question then becomes: What evidence is presented in support of this assertion? The only evidence presented in the report are the yearly "truck load averages" for the period prior to the start-up of Shoal Island and the period subsequent to the change in

scaling procedures on October 26, 1981; it is argued that the yearly "truck load averages" for each contractor are comparable in these two periods (see final remark concerning this document, comment A.19 below). The report appears to accept this as adequate evidence to conclude that the actual yearly average truck load volumes remained essentially constant throughout (covering letter and Appendix G where the argument is put forward in more detail). The position is that the yearly "truck load averages" as determined from the scaled volumes are incorrect for the period in dispute, but no direct evidence is presented as to what the yearly truck load averages might have been during this period; no data is presented concerning actual truck load volumes for the period in dispute. The position is that the only factor resulting in yearly "truck load averages" for the period in dispute differing from those in the periods not in dispute is inaccuracy in the scaled volumes for the period in dispute; this position requires that all other factors which might result in individual loads having differing actual volumes had no net effect on yearly truck load averages (that is, all other factors "averaged out" in each year). In the absence of any direct evidence for the period in dispute, this amounts to a very strong assumption.

Some detailed comments on the Thomson report follow:

1. p. 1 refers to 'the 3.5 year period ending December 1981'. As I understand it, the period in dispute is July, 1978 until October 26, 1981. The data for both 1978 and 1981 should therefor be separated into parts corresponding to whether the scaling was done during the period in dispute or not, but this is not done in much of the report. Also, the 6% adjustment which is meant to apply only to volumes scaled prior to the start-up of Shoal Island is applied to all 1978 data in several places (pp. 8, 10, 12, 17 and elsewhere).

2. p. 3 displays 590 Knight Inlet loads in 1982, while 597 is the

corresponding figure in Appendix A. Subsequent calculations appear to use the figures 597 = 151 Small + 446 Large: on page 4, 245 is indicated to be 55% of the large loads (245/446 = .549) and 1246 is indicated to be 95% of the small loads (1246/(151 + 1161) = .950); on page 5, the number of large and small loads are listed as 446 and 1312 (= 151 + 1161) respectively. The difference between 590 and 597 might be thought of as quite small, but if 597 is used in place of 590 on page 3, the corresponding load average falls from 82.93 m^3 to 81.96 m^3. If an argument is to be based upon load averages, it is essential that both the scaled volumes and number of loads going into these calculations be verified.

3. p. 3 states 'there is a direct relationship between the end area and the cubic space occupied by the load'. For logs of reasonably uniform length, one would certainly expect a strong correlation between the 'end area occupied by the load' and the 'cubic space occupied by the load' (even for logs of exactly uniform length, the relationship would not be perfect due to the irregularities in the shapes of logs). However, 'cubic space occupied by the load' is not the same as the truck load volume, and it is <u>not</u> clear how strong the relationship between truck load volume and 'end area occupied by the load' might be. Further, 'end area occupied by the load' has never been measured for the individual loads; see the above discussion of the limitations of the apparently somewhat arbitrary "end areas" which are used here and elsewhere in the report.

4. p. 4 calculations for 1981 fail to split the data into parts corresponding to periods in dispute and not in dispute and contain minor errors due (I would guess) to rounding at intermediate stages. Applying the method as described leads to imputed averages: Large = 80.85, Small = 52.26.

How sensitive are these imputed averages to the values used as "end areas"? Using 8 x 13.83 = 110.64 and 7 x 9.66 = 67.62 in place of the values 116.5 and 75.3 (values presumably obtained analogously are used on page 15 in the case of G.W. Cox & Sons Ltd. where 'no information was available on the average height of the loads') leads to imputed averages: Large = 83.03, Small = 50.75; both values differ somewhat.

It should be noted also that the Sallie Creek and Knight Inlet data for 1981 have been used together in this calculation. Yet all the Sallie Creek loads are apparently known to have been delivered by the small trucks. It would appear more reasonable therefor to carry out this calculation on only the Knight Inlet data. If necessary, the imputed average for Knight Inlet small trucks could then be combined with the known average for Sallie Creek small trucks to obtain an imputed overall average for small trucks. Applying the method as described to the Knight Inlet data (with the values 116.5 and 75.3) leads to imputed averages for Knight Inlet: Large = 81.22, Small = 52.50. This leads to the imputed overall average for small trucks of:

$$\frac{1086\ (52.50) + 230\ (49.65)}{1086 + 230} = 52.00.$$

The values differ little from the original values of 80.85 and 52.26, but note that the imputed average for Knight Inlet small trucks (52.50) differs somewhat from the known average for Sallie Creek small trucks (49.65); it might be more reasonable to deal with the data from the two sources completely separately.

5. p. 4 reports load averages for 1982 based on '55% of the large loads (245) and 95% of the small loads (1,246)'. Why wasn't all of the 1982 data used? I presume it is <u>not</u> simply because the scaled volumes corresponding to the remaining loads were not yet available; after all, the total volume for 1982 is known. As I understand it, records of the scaled volume corresponding to

every load delivered would be available. The use of only part of the 1982 data raises the question of whether the large (small) loads from which the load average has been calculated are representative of all 1982 large (small) loads. In particular, note that the 597 Knight Inlet 1982 loads (= 151 Small + 446 Large; see comment A.2) yielded a total scaled volume of 48,930.5 c.m. If the average load for all 1982 small loads was 59.55 c.m., then the average load for all 1982 large loads was 89.55 c.m., somewhat smaller than the 92.41 c.m. obtained based on '55% of the large loads'.

Since scaled volumes corresponding to the individual small and large loads are available in 1982, "truck load averages" can be calculated for each size of truck without resorting to the previous conversions based on "end area". If the data for all small and large 1982 loads had been used, these "truck load averages" are exactly the desired quantities. It may be of some interest to note what values would have been obtained had the method used for the 1981 data been used on the 1982 data. Using the Sallie Creek and Knight Inlet data together, the imputed load averages (with the values 116.5 and 75.3) are: Large = 91.24, Small = 58.97. As before, applying the method to the Knight Inlet data alone leads to imputed load averages of: Large = 90.01, Small = 58.18; this leads to an imputed overall average for small trucks of:

$$\frac{151\ (58.18) + 1161\ (59.55)}{151 + 1161} = 59.39.$$

It is clear that either way of carrying out the imputation leads to imputed load averages which differ somewhat from the load averages calculated directly from the scaled volumes.

6. p. 5 obtains a "weighted average load" for each of 1981 and 1982 which is meant to represent the average load that would have been obtained if the hauling had been done by Kyuquot Logging Ltd.

The calculation is another conversion based on "end area", with a Kyuquot truck being assigned an "end area" of 86.3 feet^2 (How is this value obtained? Did Kyuquot use only one size of truck throughout?). "Load averages", as previously imputed for 1981 and evaluated from '55% of the large loads and 95% of the small loads' for 1982, are converted into "equivalent load averages" which are then weighted by the number of loads of each size to obtain the "weighted average loads". The report appears to fail to recognize that the 1981 "equivalent load averages" for large and small trucks must be identical due to the way the imputation was carried out; there is no need to go on to calculate a "weighted average load" for 1981. Applying the method as described would lead to 1981 "equivalent load averages" of:

Large: $\frac{913 \times 116.5}{(913 \times 116.5) + (1{,}316 \times 73.5)} \times \frac{142{,}590}{913} \times \frac{86.3}{116.5} = 59.89,$

Small: $\frac{1{,}316 \times 73.5}{(913 \times 116.5) + (1{,}316 \times 73.5)} \times \frac{142{,}590}{1{,}316} \times \frac{86.3}{73.5} = 59.89.$

7. p 7 states 'Not all the S & Rs were found in the 1980 file'. Does this mean the 1980 scaled volume of 203,078 reported on p. 8 may not be accurate?

8. p. 8 applies the 6% adjustment for sinkage to all 1978 loads, although Appendix B indicates that only 26.5% of the 1978 production (26.5% of the loads or the volume?) was scaled prior to the start-up of Shoal Island.

9. p. 9 indicates a number of difficulties with the available data for John Reid & Associates and only the 1980, 1981 and 1982 data are used in what follows. Were the "two large trucks at Quatam" (presumably of the same size) the only trucks being used, or were some of these 1980, 1981 and 1982 loads hauled by trucks of other sizes? If a mix of trucks of different sizes were being used, overall truck load averages are of limited utility. The report

notes that 'the majority of the production information' could not be confirmed. This raises the question of the accuracy of the data reported.

10. p. 10 fails to split the 1981 data into parts corresponding to the periods prior to and subsequent to the change in scaling procedures on October 26, 1981.

11. p. 11 indicates a number of difficulties with the available data for White & Davidson Logging Ltd. The fact that 'small eight foot trucks hauled about 100 loads in one year' (presumably all other loads were hauled by trucks of one size) means that an overall truck load average is of limited utility for that year; the problem becomes more serious since they 'are unable to say which year'. As already noted, the number of loads for many of the 1978 booms and some of the 1979 booms was imputed; the result is that the number of loads for both 1978 and 1979 is quite uncertain. Indeed, the report notes that 'no records were available to check any of the bundle counts'.

12. p. 12 fails to split both 1978 and 1981 data into parts corresponding to periods in dispute and not in dispute. The calculations rely on the accuracy of the load counts which appear to be of doubtful quality.

13. p. 13 indicates 'no bundle count summaries available' for 1975 to 1977 for G.W. Cox & Sons Ltd., but Appendix E provides numbers of loads with each size of truck for this period. I presume this data was obtained from 'daily reports prepared from information off truck drivers' time cards' (page 16). How reliable are these counts of numbers of loads? Also note that no information at all is provided for 1978, and no calculations are subsequently attempted for 1978.

14. p. 15 obtains yearly "weighted load averages" based on "end area" conversions and comment A.6 applies here also. The "equivalent load averages" for the different sized trucks in any particular year must be identical; the values are: 1975 = 70.53, 1976 = 71.09, 1977 = 74.48, 1979 = 64.08, 1980 = 62.25, 1981 (prior to change in scaling procedures) = 70.17. Note, however, that the "weighted load averages" provided on page 15 differ only slightly from these values; the rounding errors which led to differing values for the "equivalent load averages" have largely been eliminated by the extra step of calculating the "weighted load average". Of course, the entire calculation relies heavily on the appropriateness of the "end area" conversions which in this case are carried out using end area as 'calculated using the inside dimension of the bunk and the stake heights as provided by the contractor' (page 13).

15. p. 17 states that 'additional information is required from G. Dougan before the values supplied in the Appendix can be checked' which raises the question of the accuracy of the data reported. Were all trucks used of one size throughout the time period? The calculations fail to split the 1978 and 1981 data into parts corresponding to periods in dispute and not in dispute, and apply the 6% adjustment for sinkage to all 1978 loads.

16. p. 19 reports load averages for Knight Inlet large and small trucks for 1981 and weighted averages for both 1981 and 1982 which differ from any values reported earlier on pages 3-6. How were these values obtained?

17. p. 23 presents calculated volume shortfall by contractor. The figures for Traer & Mahood and Kyuquot Logging are extracted directly from Appendix G which is discussed below.

18. Appendix G: T & S Consultants' report

18.1 Table 1 presents yearly load averages for 1975 to 1982, excluding 1978 (presumably because the first half of 1978 is not in dispute but the second half is in dispute). The load averages up to and including 1980 correspond to actual load averages for Kyuquot Logging Ltd. (the 6% adjustment for sinkage has been added to the load averages for 1975 to 1977, and the values presented differ slightly from those reported in the body of the Thomson report). The load averages for 1981 and 1982 are imputed load averages obtained via "end area" conversions for Traer & Mahood Contracting Ltd. The 1982 figure of 68.28 is determined on page 5, but there is no indication of how the 1981 figure of 59.27 was obtained. It is unclear whether the 1981 data was split into parts corresponding to periods in dispute and not in dispute. The figure incorrectly indicates 'Scaling corrected January 1, 1982', and the next page states 'A chronic underscale resulted for 3.5 years ending December 31, 1981'.

18.2 p. 3 states 'when it (a logging truck) is fully loaded ... then there is a consistent load size' which seems to be arguing that trucks are always 'fully loaded' and, as a result, load sizes (presumably measured by scaled volume) vary little from load to load, thereby 'providing a statistically accurate load average in c.m. log scale'. The only way to assess the variability of load sizes is to examine the sizes of individual loads. Some relevant data is provided in Schedule III of this Appendix; see comment A.18.7 below.

18.3 Item 1 of Schedule 1 on page 4 reports yearly load averages experienced by Kyuquot Logging Ltd. for 1975, 1976 and

1977. The 1975 data is not discussed in the body of the Thomson report, although it is provided in Appendix B. Can this data be verified? The load averages presented are remarkably consistent over this three year period.

The numbers of loads are reported as 2712, 3533 and 2229 (total = 8474), but according to Appendix B these values should be 1452, 3069 and 2826 respectively (total = 7347). It appears that the number of loads for 1979, 1980 and 1981 (Traer & Mahood Contracting Ltd.) have been recorded here accidently.

The period in dispute begins in July 1978, but the available data for the first half of 1978 is not displayed here. Why not? Is the load average for the first half of a year expected to differ in some systematic way from the yearly load average 'when scaling is correct'? If not, and if the argument being advanced is correct, presumably the load average for the first half of 1978 should be comparable to the yearly load averages for 1975 to 1977. Schedule IV on page 11 provides the data for the first half of 1978: 2519 - 1851 = 668 loads with a scaled volume of 40,450 c.m. (Note that this breakdown of the data is not provided in Appendix B. Can these values be verified?). These values lead to a load average of 60.55 c.m. and if the 6% adjustment for sinkage is added (as it was for the 1975 to 1977 yearly load averages), the load average for the first half of 1978 becomes 64.19 c.m., a value somewhat smaller (about 5%) than the yearly load averages reported here. How is this difference explained?

Note also that data presented on page 8 of the Thomson report yields the load average for all of 1978 as 60.61 c.m.; it follows (provided the data presented is correct)

that the load average based on scaled volumes for 1978 loads scaled prior to the start-up of Shoal Island is smaller than that for 1978 loads scaled subsequent to the start-up of Shoal Island.

18.4 Item 2 of Schedule I on page 5 reports 1982 load averages experienced by Traer & Mahood Contracting Ltd. as 92.41 c.m. and 59.55 c.m. for large and small trucks respectively. These are the same values the Thomson report presents as being based on '55% of the large loads (245) and 95% of tne small loads (1246)'; here the number of loads on which these load averages are based are reported to be 224 and 1161 respectively. Which is correct, and why was not all of the 1982 data used (see comment A.5)? This item is attempting to show that the yearly load averages for Traer & Mahood Contracting Ltd. in 1982 are comparable to the yearly load averages for Kyuquot Logging Ltd. in 1975 to 1977. Since the values 92.41 and 59.55 are not yearly load averages, a difficulty arises; see comment A.5 above. Comparison is based on "end area" conversions; the limitations of such conversions have already been noted.

Of course, these potential difficulties may not be real difficulties; the values 92.41 and 59.55 might be very close to the actual yearly load averages, and the conversions based on the "end area" values used may be quite accurate. In this case, the comparability of the 1982 weighted average of 68.28 c.m. with the 1975 to 1977 weighted average of 67.63 is quite remarkable. This is especially so since the comparison involves two different time periods, two different methods of scaling and two different companies with different personnel, procedures and equipment.

Note, however, that this comparability of results has nothing whatever to do with the accuracy of the scaling as appears to be suggested by Note 1 on page 6. All the results demonstrate (if the above-mentioned potential difficulties are not real difficulties) is that the two scaling procedures have led to comparable load averages when applied to two completely different sets of loads.

18.5 Schedule II on page 7 converts the reported 92.41 c.m. load average for large trucks in 1982 to an equivalent load average of 59.72 c.m. (value should actually be 59.73) for small trucks on the basis of "end area". This equivalent load average is quite close to the reported 59.55 c.m. load average for small trucks in 1982, and this is interpreted as evidence which 'confirms the validity of applying the ratio of square feet of cross section to the load average of varying truck units' (page 6).

The potential difficulties noted in comment A.18.4 are also present here. While the 'L and S loads noted above are average of actual scales in 1982 of each load size' (page 7), the load averages do not correspond to all 1982 loads of each size nor is there any indication that the loads used in arriving at these load averages are representative of all 1982 loads. Further, the "end area" values used do not appear to be based solely on 'actual measurements of the respective truck units' (page 7). While, as noted earlier, it is not clear how these "end area" values were obtained, the "average height" of 8.4 feet for large trucks and 7.8 feet for small trucks (page 4 of body of Thomson report) appears to have been used in some way. Are these "average heights" based on 'actual measurements'? It certainly seems clear that these "average heights" are not the result of measuring the height of each load and then

calculating the average for all loads of each size of truck. A skeptic might argue that these apparently somewhat arbitrary "end areas" could have been chosen so as to produce the close agreement of the equivalent load average of 59.73 with the reported load average of 59.55.

If these potential difficulties could be shown not to be real difficulties, then this close agreement would indeed be one piece of evidence supporting the validity of conversions based on these "end area" values. However, the fact that such a conversion happens to work in the single instance of 1982 Traer & Mahood loads can hardly be taken as conclusive evidence confirming the validity of the method in general. In particular, no evidence is presented that the method would work when applied to trucks of other sizes for which other "end areas" would be appropriate; for example, Kyuquot trucks. It can be argued that the method is reasonable, but that is quite different from claiming that the validity of the method has been confirmed.

18.6 Note 1 of Schedule II on page 7 states that the close agreement of the equivalent load average of 59.73 and the reported load average of 59.55 'demonstrates accuracy of scaling in 1982'. In fact, all this result demonstrates is that whatever inaccuracy may have existed is present to about the same extent (proportional to the "end area" values) in loads delivered by both small and large trucks in 1982.

The note goes on to state on page 8 that the results presented in Schedules I and II demonstrate that a 'consistent load average is to be expected ... from 1975 to 1982'. If the weighted averages of 67.63 c.m. for

Kyuquot's experience in 1975 to 1977 and 68.28 c.m. for Traer & Mahood's experience in 1982 are accepted as correct, the results demonstrate that consistent load averages were experienced in those years. As already noted, to infer that consistent load averages would also have been experienced in the intervening years except for inaccuracy in the scaled volumes requires the assumption that all other factors which might have resulted in individual loads having differing actual volumes had no net effect on yearly load averages.

18.7 Schedule III on page 9 presents a summary of the results of the 1982 scaling of 1161 S loads, grouped according to sets of boom numbers: K.I.B. 1-4 with 153 loads and a scaled volume of 8,559.2 c.m. yielding an average load of 55.94 c.m., K.I.B. 5-8 with 148 loads and a scaled volume of 8,285.2 c.m. yielding an average load of 55.98 c.m., etc. An arithmetic mean of 59.55 c.m., variance of 4.98 $c.m.^2$ and standard deviation of 2.225 c.m. are then reported. The arithmetic mean is correct, but it is unclear how the reported variance and standard deviation have been calculated. It appears these have been calculated by pretending that the 1161 loads consist of 153 loads with scaled volumes of exactly 55.94 c.m., 148 loads with scaled volumes of exactly 55.98 c.m., etc.; this would lead to a variance of 5.62 $c.m.^2$ and a standard deviation of 2.37 c.m. (standard deviation = $\sqrt{\text{variance}}$). Such a calculation is completely inappropriate, however, since it ignores the variability between loads within the different groups (almost certainly the larger of the two components of variance in this situation). The result is that the reported standard deviation of 2.225 c.m. greatly understates the actual extent to which the scaled volumes corresponding to individual loads vary from load to load; see comment A.18.2 above.

The Schedule goes on to report a 'standard error of mean' of 0.065 c.m., obtained by dividing the standard deviation by the square root of the number of loads ($2.225/\sqrt{1161} = 0.065$). Even if the reported standard deviation was correct, this calculation is completely inappropriate. The standard error of a sample mean is a measure of the extent to which the sample mean of a random sample from a given population would vary in repeated sampling. In the case where a simple random sample is drawn with replacement from a particular population, it is a basic result of probability theory that the standard error of the sample mean is given by the standard deviation of the population divided by the square root of the sample size; in practice, this measure would typically be estimated by using the standard deviation of the sample to estimate the standard deviation of the population.

In the present situation, either the 1161 S loads are the entire population of interest or the 1161 S loads are being thought of as a sample from the population of all S loads for 1982. In the first case no sampling has taken place, and in the second case it seems clear that the 1161 S loads described are merely a convenience sample and not a random sample (the 1161 S loads described appear to correspond to all 1982 loads delivered from Sallie Creek). In either case, the calculation is inappropriate; in the first case a complete enumeration of the population is available and the mean of the population is known, and in the second case no method exists to evaluate the standard error of a sample mean based on a convenience sample.

The Schedule goes on to report 95% confidence limits as the arithmetic mean $\pm$ 1.96 x standard error of mean and 99% confidence limits as arithmetic mean $\pm$ 2.58 x standard

error of mean. Since the reported standard error of mean has no meaning, these confidence limits are also completely meaningless. Note that even if these confidence limits were meaningful, they are completely incorrectly interpreted on the top of page 10.

18.8 The table of Schedule III on page 10 examines what total scaled volume would be predicted for 1982 based on the reported load averages of 59.55 c.m. and 92.41 c.m. The numbers of small and large loads differ slightly from those reported in the body of the Thomson report (1300 and 451 here instead of 1312 and 446) as does the total scaled volume (118,063 here instead of 118,067.1). The net result, however, is that the predicted total scaled volume is quite close to the total scaled volume. Of course, the prediction would agree <u>exactly</u>, except for rounding errors, if the reported load averages had been based on all 1982 loads not just '55% of the large loads and 95% of the small loads'. This merely provides some indication that these reported 1982 load averages are not too much different from the actual 1982 load averages. The question of why not all of the 1982 data was used remains (see comment A.5).

18.9 Schedule IV on page 11 fails to separate the 1981 data into parts corresponding to periods in dispute and not in dispute although this is done for 1978. Note that the 1851 K units for 1978 indicates that the 73.5% dryland scale for Kyuquot in 1978 reported in Appendix B refers to the number of loads (73.5% of 2519 = 1851), not the volume scaled (see comment A.8).

19. Final remark: It is important to note that many of the above comments concern limitations of the available data, some apparently rather arbitrary inputs to the calculations (the 6%

adjustment for sinkage, values used as "end areas") and details of some of the calculations, but not the appropriateness of the basic method being employed to impute the volume shortfall. If it was agreed that the basic method was appropriate, agreement might be reached on how to handle these various difficulties. The key to the appropriateness of the basic method is the assertion that the actual yearly average truck load volumes for each contractor remained essentially constant throughout. Yet, the available data for the period not in dispute is somewhat limited for most of the contractors, sometimes of questionable quality, and not entirely convincing (see summary which appears at the end of this remark). Further, the assertion requires the assumption that during the period in dispute all factors (other than possible inaccuracy in the scaled volumes) which might have resulted in individual loads having differing actual volumes had no net effect on yearly load averages; no direct evidence has been provided as to whether or not this may have been the case. On the other hand, if it can be verified, the data do provide convincing evidence that load averages were lower during the period in dispute. The critical question is whether this can be entirely attributed to inaccuracy in the scaled volumes or whether other factors may be partly or entirely responsible.

Summary of Available Load Averages[1]

Contractor		1975	1976	1977	1978	Period in Dispute 1978	1979	1980	1981	1981	1982
T & M[2]:	SC-S								--49.7--		59.6
	KI-S								--52.5--		59.6
	KI-L								--81.2--		92.4
Kyuquot[3]		67.7	67.5	67.7	64.2	60.6	55.2	57.5			
Reid[4]:	S		na	na	na	na	na				
	L		na	na	na	na	na	76.3	--74.2--		80.9
W & D[5]					na	na	na	55.3	--54.2--		56.6
Cox[6]:	S	52.6	53.1	55.6	na	na	45.1	43.8	49.4		
	M	58.7	59.2	62.0	na	na					
	L	74.8	75.4	78.9	na	na	64.1	62.3	70.2	78.4	81.5
Dougan[7]				67.9	--68.4--		59.6	56.3	--57.0--		63.2

Notes: 1. In some cases the split of the 1978 and 1981 data corresponding to periods in dispute and not in dispute is not provided; load averages displayed as --xx.x-- appear to be based on data from both periods. The 6% adjustment for sinkage has been added to the actual load averages corresponding to the period prior to the start-up of Shoal Island, and is also included (inappropriately) in Dougan's 1978 figure of --68.4--.

2. Sallie Creek load averages as provided. Knight Inlet averages for 1981 as per comment A.4. Knight Inlet averages for 1982 as reported based on '55% of the large loads and 95% of the small loads', but see comment A.5.

3. As provided except for the 1978 figures as per comment A.18.3.

4. Load averages for 1976 to 1979 not available since trucks of two sizes were used but separate load counts not available. Load averages for 1980 to 1982 as provided, assuming the 'two large trucks at Quatam' were the only trucks being used (see comment A.9).

5. Load averages for 1978 and 1979 not available since load counts are partly imputed in both years. Load averages for 1980 to 1982 as provided, ignoring other possible difficulties (see comment A.11).

6. Load averages for 1975 to end of period in dispute obtained via conversions based on "end areas" as per Appendix E of the Thomson report (figures differ due to extensive rounding errors in Appendix E), but see comments A.13 and A.14.

7. Load averages as provided, but see comment A.15.

B. Ombudsman's Report

There is little in this report upon which I feel a need to comment; the quantitative evidence presented appears in one or more of the other documents being reviewed. A few detailed comments follow:

1. In a number of places the report incorrectly refers to the change in scaling procedures taking place 'at the end of 1981' (page 8) or 'in January 1982' (page 35).

2. The report concludes that 'a volume of Crown timber was processed through Shoal Island during the 1978-1981 period without being scaled' (page 75). The main quantitative evidence cited as supporting this conclusion is that provided in the Thomson report, together with the results of the check scales of September 1-4, September 21-25, and October 5-9, 1981. In addition, the report cites statements made by various Ministry of Forests staff as evidence that 'there is general acceptance within the Ministry of the fact that some timber passed through Shoal Island without being scaled' (page 38).

3. The report states that 'one of the contractors has kept records which show that his truck load averages vary by less than 1%' (page 19). To what data does this refer?

4. The report recommends 'that the Ministry of Forests prepare an estimate of the unscaled timber' (page 25), but recognizes 'that there may be some difficulties involved in accurately calculating the required estimate' (page 43). In particular, the report recognizes the apparently somewhat arbitrary nature of the 6% adjustment for sinkage: 'the 6% figure may be low or it may be high; but it seems logical that some such factor would have to be added to the pre-Shoal Island data to obtain a proper estimate' (page 40). The report 'did not recommend that the complainants'

figures necessarily be used as the estimates of the unscaled volume' (page 96), and does not recommend any particular method of obtaining the desired estimate, but does suggest that additional relevant data could be provided by British Columbia Forest Products Ltd.

C. Briefs Submitted Prior to the Inquiry

(i) Kyuquot Logging Ltd.

This brief describes the experience of Kyuquot Logging Ltd. at Knight Inlet during the period 1975 to 1980. A truck load averaging system used by Kyuquot for predicting what the total scaled volume would be in a given year is described as follows: Based on a visual inspection, the dump man determined whether each load should be recorded as a full load (assigned a nominal volume of 62.30 c.m.) or a half load (assigned a nominal volume of 31.15 c.m.). The nominal total volume for a given year can then be calculated from the record of full and half loads; this nominal total volume was their prediction of total scaled volume. The brief states that 'Kyuquot planned its estimates so that actual scale returns would result in a 12-13% overrun of its camp estimate' (page 12); the production analysis on page 13 reports the overruns for 1975, 1976 and 1977 as 12.2%, 13.3% and 11.7% respectively.

The brief notes that even larger overruns of 17-22% were anticipated with the start-up of Shoal Island. In fact, the opposite occurred: corresponding to a decrease in truck load average from 63.90 c.m. in 1977 to 60.86 c.m. in 1978, the overrun decreased from 11.7% in 1977 to 7.0% in 1978 (figures taken from page 13; figures on page 18 differ slightly). Overruns were even smaller in 1979 (-3.2%) and 1980 (2.8%), despite the fact that by mid-1979 'Kyuquot had already modified its half load policy' so that the 'camp estimates were even more conservative than before' (page 19).

The brief indicates Kyuquot suspected these results were due to difficulties with the scaling procedures at Shoal Island and interprets the apparent effect of the change in procedures of

October 26, 1981 as convincing evidence that this was the case (page 22). The brief reports the results of an imputation of the volume shortfall 'which Kyuquot suffered through improper scaling procedures at Shoal Island' (page 23), but does not indicate how this imputation was carried out. Document F (letter of D.B. Kirkham of October 30, 1984) later clarifies that this imputation was carried out essentially as in Appendix G of the Thomson report. Thus the argument being used, although never explicitly put forward here, appears to be the same as in that document; as such it suffers from the same deficiencies.

It should be noted, however, that page 13 also reports the nominal yearly load averages derived from Kyuquot's estimating system for each year from 1975 to 1980. The brief clearly interprets these nominal yearly load averages as direct evidence as to what the actual yearly load averages must have been during the period in dispute. This would be reasonable if the estimating system could be assumed to be reliable during the period in dispute.

A few detailed comments follow:

1. p. 2 states that in late 1978, 'Kyuquot complained to BCFP about the significant reduction in its S & R volumes compared with its average load volume estimates'. Were check scales done in response to this complaint? If so, is the data available (either from the Ministry or from BCFP)?

2. p. 5 argues that the statement 'average volumes per truck are notoriously unreliable as a means of checking the scale' (page 3 of Tab 3) is 'simply inapplicable to Kyuquot'. The statement refers to actual yearly truck load averages and page 13 demonstrates that Kyuquot had

remarkably consistent load averages of 63.92, 63.72 and 63.90 c.m. in 1975, 1976 and 1977 respectively. However, it does not necessarily follow that the actual yearly truck load averages continued to display this consistency in the period 1978 to 1980. It should also be noted that this statement does not refer to the nominal yearly load averages derived from Kyuquot's estimating system which this section of the brief goes on to discuss in detail.

3. Kyuquot's policy of recording loads as either half loads or full loads (pages 10 and 11) suggests that load sizes actually varied considerably from load to load. Loads larger than the nominal volume of 62.3 c.m. for a full load were clearly common (the load averages for 1975 to 1977 on page 13 are all larger than 62.3 c.m.), and presumably at least some loads had volumes not too different from the nominal value for a half load of 31.15 c.m. For the sake of doing a rough calculation, suppose that in a given year 18% of all loads had actual volumes of exactly 31.15 c.m. and the remaining 82% had actual volumes of exactly 62.3 c.m. (the data on page 11 suggests that roughly 18% of all loads were recorded as half loads by Kyuquot). In this case, the volumes of the loads for that year would average 56.69 c.m. with a standard deviation of 11.97 c.m; scatter of the values around 31.15 and 62.3 would result in an even larger standard deviation. This casts some doubt on parts of Appendix G of the Thomson report; see comments A.18.2 and A.18.7 above. Note also that the figure 31.5 c.m. which appears on both pages 10 and 11 should presumably be 31.15 c.m.

4. p. 13 fails to present the 1981 data for the periods previous to and subsequent to the start-up of Shoal Island, although it does report that 26.5% of the 1978 production

(this apparently refers to numbers of loads - see comment A.18.9) was scaled prior to the start-up of Shoal Island. The data for the first half of 1981 would provide additional evidence concerning the performance of Kyuquot's estimating system and the consistency of load averages prior to the start-up of Shoal Island; see comment A.18.3. Note also that "loads reported" and "load average used" differ slightly from the values reported on page 11.

5. While 'the production results which Kyuquot obtained between 1975 and 1977' provide evidence in support of 'the validity and predictability of volume estimates based on the truck load averaging system' used by Kyuquot (pages 15 and 16), I fail to see how 'the production results ... its replacement contractor, Traer & Mahood, achieved after November 1981' (page 15) provide such evidence. The estimating system based on nominal truck load averages used by Kyuquot has never been applied to provide predictions of scaled volumes for Traer & Mahood.

6. p. 16 states that 'BCFP had sufficient faith in Kyuquot's estimating system when it had to reconcile a considerable amount of wood loss due to the breakup of a large barge. This occured in November 1975' (date should be November 1974). One might wonder why the 1974 year-to-date Kyuquot actual load average (or even the actual load average for the entire 1974 year, although this might only be available at a later date) was not used in this reconcilation. However, if Kyuquot's estimating system results in 12%-13% overruns, then the use of Kyuquot's estimating system would result in a smaller imputed total volume for the barge, thereby leading to a smaller incurred cost to BCFP. It is not clear that this reconcilation should be viewed as evidence of BCFP's 'faith in Kyuquot's estimating system'.

7. p. 26 refers to 'the actual scale return results achieved by the five other contractors after procedures at Shoal Island were corrected at the end of October 1981, when compared with their camp estimates', but no such comparison is reported in this brief.

8. I do not understand the claim that 'the comparative record of the various contractors further supports the validity of the truck load averaging system for estimating the volume of timber delivered to a facility in comparison with the actual scale returns' (pages 26 and 27). Is the reference to Kyuquot's estimating system? What is meant by 'the comparative record of the various contractors'?

9. p. 27 asserts that a method of estimating the volume shortfall 'consists of the volume of timber delivered to Shoal Island based on the truck load averaging system, in comparison with actual annual scale return results'. Since the only "truck load averaging system" explicitly discussed in the brief is Kyuquot's estimating system, and since the thrust of much of the brief concerns its validity, this seems to be an assertion that Kyuquot's estimating system should be used to estimate the volume shortfall experienced by Kyuquot. Yet, Kyuquot's estimating system does <u>not</u> enter into the imputation carried out on page 23; see Document F. Note that the use of Kyuquot's estimating system to estimate the volume shortfall would have the desirable feature that year-to-year variation in load sizes (to the extent this is captured by Kyuquot's records of full and half loads) would be explicitly incorporated into the estimation. Nevertheless, no direct evidence is presented concerning the reliability of the estimating system during the period in dispute.

(ii) Traer & Mahood Contractors Ltd. et al

The argument put forward in this brief is expressed in terms of the "CEL Factor" which is defined as the 'average volume carried for each square foot of cross section between the bunks' of the trucks used to haul the loads (page 17). It follows that the CEL Factor for a contractor using a single size of truck in a given period is simply the average truck load volume for that period divided by the cross section between the bunks of the size of truck being used; arguments about truck load averages and CEL Factors are obviously closely related. However, this brief uses only the 'cross section between the bunks', a quantity which presumably can be verified by direct measurement, thereby avoiding the apparently somewhat arbitrary "end areas" used in the Thomson report (which are meant to represent 'the end area ... occupied by the load'; see page 3 of Thomson report) as well as the difficulties associated with conversions based on those "end areas".

Nevertheless, the basic argument put forward here has much in common with the argument put forward in the Thomson report. Whereas previously the key to the argument was the assertion that yearly average truck load volumes for each contractor remained essentially constant throughout, the key here is the assertion that the CEL Factors for each contractor remained constant throughout, except for an adjustment required for those contractors using "high stake loading" when cedar content was 26% or greater. Indeed, the assertion made here is even stronger: the CEL Factors are also asserted to be identical for all contractors using high stake loading, except for the adjustment required for cedar content; the different personnel, procedures and equipment employed by different contractors are asserted to have no net effect on the CEL Factors. As for the Thomson report, the critical question then becomes: What

evidence is presented in support of this assertion? Is direct evidence presented as to what the CEL Factors might have been during the period in dispute?

Detailed comments on this brief follow. Since the brief relies heavily on the Crawford E. Laing report to claim that the method being proposed to evaluate the volume shortfall is 'statistically accurate and reliable' (page 13) and indeed is 'the only statistically reliable method available' (page 13), we begin with a discussion of this report.

1. Appendix II: Crawford E. Laing report

1.1 The report presents 'a statistical analysis of certain data which have been supplied to us' (page 35); the data correspond to the production of Traer & Mahood Contracting Ltd. and are 'shown in detail in Appendices A to C' (page 37). In fact, Appendices A to D are presented, as follows:

A: 1982 Scaling of 1161 S Loads (from Sallie Creek),

B: 1982 Scaling of 316 L Loads (from Knight Inlet),

C: 1983 Scaling of 1105 S Loads (from Sallie Creek),

D: 1983 Scaling of 615 S Loads (from Knight Inlet).

The summary presented in Appendix A is the same as that which appears in Schedule III of Appendix G of the Thomson report and clarifies that the data considered there (see comment A.18.7) consist of all 1982 loads from Sallie Creek. On the other hand, the loads summarized in Appendix B are a subset of all

(446) 1982 L loads from Knight Inlet; the remaining 130 L loads and the 151 S loads from Knight Inlet in 1982 do not appear in these summaries. Appendices C and D summarize nearly all 1983 loads from each source (page 58 indicates a total of 1764 loads in 1983), but the data in Appendix D is never referred to in the body of the report.

1.2 p. 36 evaluates CEL Factors of 0.787 for small trucks (based on the data in Appendices A and C) and 0.786 for large trucks (based on the data in Appendix B). These CEL Factors are remarkably similar; can the cross sections which lead to them (S = 75.68, L = 113.50) be verified? Note that these cross sections are curiously similar to the "end areas" used in the Thomson report for these same trucks (S = 75.3, L = 116.5). Using the dimensions reported in the Thomson report would lead to quite different cross sections: S = 67.62, L = 110.64; see comment A.4. The resulting CEL Factors would be 0.881 for small trucks and 0.806 for large trucks.

1.3 p. 36 evaluates an equivalent 'average volume for a K truck having 86.3 square feet of load cross section' as 0.786 x 86.3 = 67.83 c.m. This calculation does not seem to make sense since the cross sections used to evaluate the CEL Factors are cross sections 'between the bunks', but 86.3 is reported as the "end area" of a K truck (meant to represent 'the end area ... occupied by the load') in the Thomson report. Indeed, applying the same sort of calculation to obtain equivalent average volumes for either S or L trucks would lead to the ridiculous result that the equivalent average volume so calculated would be

considerably larger than the average volume which itself led directly to the CEL Factor being used (assuming that the "end area" value representing the end area occupied by the load would be considerably larger than the cross section between the bunks). It is quite clear that the argument of the brief intends for these CEL Factors to be used only with cross sections; the value of cross section reported for a K truck is 72.0 (page 19).

1.4 p. 36 states that if the equivalent average volume for a K truck of 67.83 c.m. 'is applied to calculate the volume delivered for the period of 1975 to 1977, the calculated volume for each year conforms to the volume shown on the S & R scale returns'. I think what is meant are the adjusted S & R returns, where the 6% adjustment for sinkage is included. The report goes on to state 'hence, this average volume per K truck can be used with confidence to calculate the volume harvested during other periods'. Based on the fact that the yearly average volume for a K truck was essentially constant in 1975, 1976 and 1977, Mr. Laing is prepared to <u>assume</u> that the yearly average volume will remain at essentially this same value in other time periods; but, see comment A.18.3. Of course, Mr. Laing may be drawing additional support for this leap of faith from the dubious calculation discussed in the comment above. Nevertheless, this seems to be the basis for the statement that 'our analysis confirms that the average load for each size of truck is quite consistent over the period'. In fact, all that has been confirmed is that the average load for S trucks is essentially the same in 1982 and 1983 and the average load for K trucks is essentially

the same in 1975, 1976 and 1977. Nothing appears to have been demonstrated concerning these two levels of average loads, nor can anything be said about the intervening time period without making strong assumptions.

1.5 p. 36 states that 'in all, 2,863 loads were logged during 1982 and 1983', but the loads summarized in Appendices A to D total 3197 while page 58 reports a total of 3522 loads.

1.6 p. 37 presents calculations for each of the sets of data in Appendices A to C corresponding to the calculations already carried out on the Appendix A data set in Schedule III of Appendix G of the Thomson report. The same criticisms made there apply here; see comment A.18.7. In particular:

(a) the standard deviation is incorrectly calculated and greatly understated. The value 2.37, arrived at in comment A.18.7 by a completely inappropriate calculation which greatly understates the actual variability of the data, is reported here for the Appendix A data set (1982 S loads). It is easy to check that the values reported for the other data sets are obtained by the same inappropriate calculation. Rough calculations suggest the actual standard deviations could easily be four times as large as the reported values; see comment C.(i).3 and the final remark concerning this brief, comment C.(ii).23 below.

(b) a basic result of probability theory which applies only in very particular circumstances has been inappropriately applied to obtain the 'standard error of the mean' for each of the data sets.

(c) the 'standard error of the mean' has been used to report confidence intervals which are completely meaningless.

Since these calculations have little meaning, conclusions which follow from them are not supported. In particular, the statement that 'the average volume per square foot of cross-section is also statistically reliable, with a 95% probability of being within 1% of the mean' (page 35) is <u>not</u> supported by these calculations.

1.7 p. 38 states that 'the averages developed herein can be used with confidence to estimate the volume of timber harvested during other periods', but even if all the preceeding calculations were appropriate and correct, such a conclusion simply could not be drawn. Such an extrapolation to time periods from which no data is available requires the very strong <u>assumption</u> that if data had been collected in those other time periods, it would "be similar".

1.8 Final remark: Although most of the conclusions drawn in this report are simply not supported by the data considered and the calculations carried out, it does not necessarily follow that the argument put forward in the brief has no merit. The method being proposed to evaluate the volume shortfall may be perfectly

reasonable, but this report does not justify the claim that the method is 'statistically accurate and reliable' (page 13).

2. p. 5 states BCFP 'undertook to Kyuquot in September, 1978 to investigate its scaling system'. Did such an investigation take place? If so, is the data available?

3. p. 11 states 'the question (estimation of volume shortfall) cannot be answered by using the data and figures in the Whittaker memorandum', and the brief goes on to cite four ways in which conditions during the check scales 'were not identical to the normal operation of Shoal Island' (page 12). While the last of these, 'under normal circumstances ... logs were sometimes cut and sometimes removed prior to scaling' appears to suggest that some logs never even went through the scaling process (Was this so? If so, was this aspect any different during the check scales?), the others appear to be modifications which would be expected to lead to more accurate scaling. If so, perhaps the data from these check scales provide a reasonable lower bound on the extent of the volume underscale (at least during the period of the check scale)? Were these modifications in effect equally during the different checks scales? Perhaps the first of these check scales is the most relevant?

4. p. 12 presents two other reasons why 'these so called "check scales" and the differences reported are misleading and completely unreliable as a criteria for determining the volume not scaled' (page 11), but the implications of these are unclear to me.

5. p. 14 argues that 'every trip is a "fully loaded truck"' when 'normal conditions under which a logging truck transports timber volume' exist (page 15). This seems to be arguing that scaled volumes vary little from load to load, but this seems doubtful (see comment A.18.2). Even the averages presented in Appendices A to D of the Crawford E. Laing report display considerable variation; as already noted (see comment C.(i).3 and C.(ii).1.6), the individual loads would undoubtedly display considerably more variation. See comment C.(ii).23 below.

6. pp. 16 and 17 list a number of utilizations of 'the Truck Load Average method of ascertaining volume', but these bear little relation to the utilization being proposed where yearly load averages, or the (essentially) equivalent CEL Factors, from one period of time are to be used to impute what the load averages must have been in a different period of time.

7. p. 18 asserts that Table I (page 19) 'shows the reliability of the Truck Load Average Volume when compared to accurate Ministry Part 6 scales and demonstrates the chronic underscale in the period mid 1978 to 1981 at Shoal Island'. Let us examine this table in detail.

   The following production data for Kyuquot (1975 to 1977 data from page 13 of document C.(i)) have been reported:

				1978 pre Shoal Island	
	1975	1976	1977	comment A.18.3	page 59
Loads	1452	3069	2826	668	634
Actual Scale	92,809	195,569	180,589	40,450	-
x 1.06	98,378	207,303	191,424	42,877	42,887
Load Average	67.75	67.55	67.74	64.19	67.65
CEL Factor	.9410	.9382	.9408	.8915	.9395

The consistency of the CEL Factor over the years 1975 to 1977 is quite remarkable. The situation is not clear for the 1978 data; the correct number of loads for the period prior to the start-up of Shoal Island appears to be in doubt. The figure 668 was obtained in comment A.18.3 by subtracting the 1851 loads reported for 1978 subsequent to the start-up of Shoal Island from the total of 2519 loads reported for 1978 (page 8 and Appendix B of the Thomson report and page 13 of document C.(ii)). Yet page 59 reports the pre and post start-up of Shoal Island 1978 loads as 634 and 1851 for a total of only 2485 loads. Which of these figures is correct? If 668 is correct, the load average and CEL Factor for 1978 pre Shoal Island are somewhat different from those for 1975 to 1977, while if 634 is correct, these 1978 values are remarkably consistent. Indeed, using 634 leads to a load average of 67.63 which is almost exactly equal to the average load of 67.66 (=(98,378 + 207,303 + 191,424)/(1452 + 3069 + 2826)) for the 1975 to 1977 period. Note that the average load for the 1975 to 1977 period is reported as 67.63 in Schedule I of Appendix G of the Thomson report.

The CEL Factor of 0.939 for K trucks is apparently obtained from the 1976, 1977 and 1978 pre Shoal Island data (see pages 43 and 47). Using the data on page 59 of the brief leads to an average load for this period of 441,614/6529 = 67.64 which results in a CEL Factor of 0.939 (number of loads incorrectly reported as 6531 and 6131 on pages 43 and 47 respectively). The fact that this CEL Factor when applied to the 7347 loads delivered in the 1975 to 1977 period leads to a "volume estimated by load average" which agrees very well with the scaled volume reflects the remarkable consistency of the load averages throughout the period.

Note, however, that the volumes for 5895 (all 1976 and 1977 loads) of the 7347 loads for which the "estimated volume by load average" is being calculated actually entered into the determination of the CEL Factor. Consquently, the load average of the remaining 1452 (all 1975) loads would have to have been quite different before the "volume estimated by load average" in this way would differ substantially from the "volume scaled per S & R returns". It is easy to calculate that provided the scaled volume corresponding to the 1452 loads delivered in 1975 was between 93,295 and 103,235 (which corresponds to any load average between 64.25 and 71.10), the two quantities being compared would differ by less than 1% of the "volume scaled per S & R returns".

Similar comments pertain to the last column of Table I dealing with the Traer & Mahood production data, although the calculations now involve two sizes of trucks. Data on most of the 1982 and 1983 loads (the data in Appendices A to C of the Crawford E. Laing report corresponds to a volume of 163,158.5 out of the total reported scaled volume of 223,178) is used to obtain a CEL Factor of 0.787. This factor is then applied to all loads delivered in 1982 and 1983 to calculate a "volume estimated by load average" which agrees very well with the total reported scaled volume. Note, in particular, that the data which entered into the determination of the CEL Factor consisted of data from throughout the same period of time as the loads for which the "volume estimated by load average" is calculated. Of course, the fact that the agreement is so close does indicate that the CEL Factor based on all the 1982 and 1983 loads would be very close to 0.787. But see comment C.(ii).1.2. above.

What then does Table I demonstrate? The data in the first and third columns of this table appears (subject to the difficulties noted above) to demonstrate remarkable consistency of CEL Factors for Kyuquot in the period 1975 to the start-up of Shoal Island and for Traer & Mahood in the period 1982 to 1983. However, this tells us nothing about what the CEL Factors might have been during the period in dispute unless we are willing to assume that this apparent consistency also extends to other periods of time where the relevant data is not available.

8. p. 18 states that 'the CEL Factor of 0.787 ... is applicable to a Hemlock-Balsam strata with less than 26% Cedar content'. How was this sharp cut-off of 26% determined?

9. p. 20 claims that 'Table II confirms the accuracy of the CEL Factor'. It is hard to know what to make of this table (page 21) since very little explanatory information is provided. Can all of this data be verified? Is data from other locations relevant? Presumably only 'the high stake loading policy' is being used by these contractors, and the CEL Factors are obtained as described in Appendices III & IV. The data in the last two columns of this table is combined in the third column of Table I (page 19). Since the CEL Factor for Reid's data (third column) appears to be one of the six points determining the graph on page 49, it should not be particularly surprising that the agreement is good for this column.

A key question is: How was this table constructed? Suppose one examined the data for many different contractors at many different locations and in many

different years and, for each of these data sets, constructed the same summary as appears in a single column of Table II. It seems clear that if enough such summaries were constructed, then at least some of the summaries would exhibit the desired pattern (or, indeed, any other reasonable pattern we might care to specify). What assurance do we have that Table II was not constructed in this way?

10. p. 28 states that 'the bundle by bundle scale was rejected' because 'bundles were split in several parts at Shoal Island resulting in more bundles scaled than were delivered' and boomsticks which 'formed containment sticks for the boom' were removed 'resulting in a load bundle that was not a full load'. If this was the case, it would appear to be difficult to determine scaled volumes corresponding to the loads delivered by contractors except on a boom-by-boom basis. This would represent a fundemental limitation on the form of the available data; see comments A.5, A.18.4 and A.18.8. It also suggests that records of load numbers kept by the contractors might not agree with records of bundles derived during the scaling process and kept by the Ministry and/or BCFP. Can these load counts be verified? Were the boomsticks dealt with consistently throughout the period in the manner described on page 31, or is it possible that during the period in dispute the boomsticks were occasionally counted as separate "loads" (possibly because contractors relied on the Ministry and/or BCFP to provide records of "load numbers") thereby leading to an apparent decrease in "load average". If an argument is to be based on load averages or the closely related CEL Factors, it is essential that these load counts be verified.

11. p. 30 states that 'where bundles from the respective truck units were intermingled in the boom they were not included in the study except for booms #K.I. 3, 5 and 14, which included 8, 11, 14 S loads respectively'. This clarifies why the Crawford E. Laing report deals with only a subset of both the S and L loads for 1982; see comment C.(ii).1.1. Presumably scaled volumes corresponding to these S loads could be identified and extracted so as not to mix S and L loads in the analysis.

12. p. 43 states 'a full load for every trip is a rigid policy', but see comment C.(ii).5 above.

13. p. 43 reports 'weighted average CEL factor' for both Kyuquot and Dougan; the calculation leading to the CEL Factor of 0.939 for Kyuquot was considered in comment C.(ii).7 above. The calculation for Dougan is similar, but again the data presented for Dougan on page 62 of this brief differs from that presented on page 17 of the Thomson report:

	Thomson report			page 62			
	1977	1978	1982	1977	1978pre	1978post	1982
Loads	1351	1513	976	1351	740	773	929
Actual Scale	86,552.4	97,659.8	61,650.5	-	-	50,453	61,650
x 1.06	91,746	103,519	-	91,746	50,039	-	-
Load Average	67.91	68.42	63.17	67.91	67.62	65.27	66.36
CEL Factor	.9432	.9503	.8773	.9432	.9392	.9065	.9217

Two changes have occured. The 1978 production of 97,659.8 c.m. from 1513 loads has been split into 50,453 c.m. from 773 loads corresponding to the period subsequent to the start-up of Shoal Island and 47,206.8 c.m. (47,206.8 x 1.06 = 50,039.2) from 740 loads corresponding to the

previous period. The latter figures lead to a load average of 67.62 c.m. which is very close to the 1977 load average; the corresponding CEL Factors are therefore also very close. Can this split of the 1978 data be verified?

The second change is that the number of 1982 loads is now reported as 929 and the corresponding load average of 66.36 is much closer to the load averages for the period prior to the start-up of Shoal Island than is the value 63.17 obtained using the previously reported 976 loads for 1982. Which of these is correct?

Assuming the split of the 1978 data is correct, the average load corresponding to the 1977, 1978 pre and 1982 data is calculated as 203,435/3020 = 67.36 c.m. if 929 is the correct figure, and as 203,435/3067 = 66.33 c.m. if 976 is the correct figure. The corresponding CEL Factors are 0.936 and 0.921; the consistency argument is clearly stronger if 929 rather than 976 is the correct figure.

14. p. 44 reports cross sections from various trucks. The single cross section reported for Cox appears to refer to its Terex (and WHDX?) trucks; no cross sections are reported for its HDX (S) and Hayes (M) trucks, although these are reported as 69 and 77 respectively in Appendix E of the Thomson report. A single cross section is reported for Reid, but the Thomson report (page 9) indicates the use of 'two size trucks at Southgate' (to the end of 1979) and 'two large trucks at Quatam' (as well as others?); see comment A.9. The dimensions reported for the Traer & Mahood trucks differ in the Thomson report (page 4); see comment C.(ii).1.2. above. Recall that for White & Davidson 'small eight foot trucks hauled about 100 loads in one year', but they were 'unable to say which year'.

Can the reported cross sections be verified? The incompleteness of this data and uncertainty concerning its accuracy has serious implications for the volume shortfall calculations carried out in Appendix VIII of this brief.

15. p. 45 states that 'the factor (0.787) applies to a Hemlock Balsam stratum with less than 29% cedar content'. Should this be 26%? See comment C.(ii).8 above. Also note the figure 0.787 comes exclusively from Traer & Mahood production data for 1982 and 1983. Why should the same figure be expected to apply to other time periods and to other contractors? The only evidence is that supplied in Table II; see comment C.(ii).9 above.

16. p. 45 states that for high stake loading 'the CEL Factor ... increases in direct response to an increased percentage of cedar'; the evidence consists of the six data points presented in Appendix IV (page 49). Each data point corresponds to the percent cedar and CEL Factor for the production of a given contractor in a given year (or part of year) and scaled at a given location. Two of the data points correspond to scaling not at Shoal Island; this data does not appear elsewhere in the brief. Is data from other locations relevant? Can it be verified? Of the remaining four data points, three correspond to contractor Cox: 1981 for the period subsequent to the change in scaling procedures as reported on page 21, 1982 and 1983 as reported on page 63 (CEL Factors of .800, .832 and .870 respectively differ slightly from reported values of .800, .831 and .876). The remaining data point corresponds to contractor Reid in 1982 as reported on page 60 (note that the same data appears to have been incorrectly recorded in column three of Table II on page 21). Using the cross section of 100 reported on page 60

leads to the reported CEL Factor of .809. But the cross section for Reid is reported as 108.5 on page 44; using this value would lead to a somewhat different CEL Factor of .746. Which is correct? Page 47(a) seems to suggest 100 is correct subsequent to 1978.

A line is then fitted to these six data points 'using least squares: correlation coefficient = .969'. This correlation coefficient may seem impressively close to 1, but it is determined by only six data points. Further, these data points are not data corresponding to individual loads, but rather averages over all loads for the particular contractor in that time period; the correlation coefficient of .969 is calculated from these averages, not from data corresponding to individual loads. The value .969 indicates that these six data points lie reasonably close to a straight line; the data points corresponding to the 5421 individual loads entering into these averages would undoubtedly demonstrate much more scatter. Indeed, the fact that considerable scatter would be present is clear even from these averages; data points (2) and (6) correspond to virtually identical cedar content (32.4% and 32.0% respectively), but the CEL Factors differ considerably (.832 and .809 respectively). Note also the discussion above which suggests the possibility that this last value should be .746. If this value really should be .746, the resulting fitted line and corresponding correlation coefficient would both differ considerably from those reported here.

The data presented do not permit a determination of what the relationship between CEL Factor and cedar content would be for the 5421 individual loads which enter into these six data points. It is even possible that the

relationship between CEL Factor and cedar content exhibits a negative association (CEL Factor decreases as cedar content increases) for each of the six data sets corresponding to the individual loads entering into each of the six data points reported here. While this may seem unlikely in this context, no evidence is presented which excludes this possibility.

In summary, the data supporting this 'direct response to an increased percentage of cedar' are rather limited. Yet the relationship fitted on the basis of these six data points is to be used to obtain CEL Factors for all contractors using high stake loading and in any time period.

17. p. 46 displays various load averages and CEL Factors. According to page 62, Dougan had load averages of 67.91 (CEL Factor = .943) in 1977 when cedar content was 48.1% and 65.33 (CEL Factor = .907) in 1983 when cedar content was 53.0%. Concerning Dougan's data over the period 1977, 1978 and 1982, see comment C.(ii).13 above.

18. p. 47 reports no CEL Factor for White & Davidson; Appendix VIII uses .856 on page 61. Using the 1982 and 1983 production data would lead to an average load during this period of 56.77 and a CEL Factor of either .854 (using the cross section of 66.5 reported on page 61) or .839 (using the cross section of 67.7 reported on page 47).

19. p. 48 reports CEL Factors 'as determined by analysis', but these values do not appear to correspond to the fitted line obtained on page 49. Using the six data points reported on page 49 leads to a line 'fitted by least squares' which predicts CEL Factors of .800, .811, .825,

.839 and .853 corresponding to cedar contents of 26%, 30%, 35%, 40% and 45% respectively. Note that the CEL Factor of .800 predicted by the line at cedar content 26% differs somewhat from the CEL Factor of .787 which is to be used whenever cedar content is 26% or less.

20. p. 50 reports an estimated volume via CEL Factor for the check scale of October 5-9, 1981, but the details of the calculation are not presented. Is this the same calculation reported in column four of Table II on page 21?

21. Appendix VIII is a revised determination of the volume shortfall prepared by T.M. Thomson & Associates Ltd. and based on the method proposed in the brief. Note the following:

21.1 the calculations fail to split the 1981 data,

21.2 load counts for Kyuquot differ from earlier report; see comment C.(ii).7,

21.3 estimates are now produced for Reid using a single cross section in each year despite apparent use of different sizes of trucks; see comment A.9,

21.4 estimates are not produced for White & Davidson in 1978 or 1979, but possible difficulties with 1980 and 1981 data appear to be ignored; see comment A.11,

21.5 cross section used for White & Davidson is 66.5, but brief reports value 67.7 on page 47,

21.6 load counts for Dougan now reported as 1452, 1206 and 929 for 1979, 1981 and 1982,

21.7 calculations for Cox corresponding to low stake trucks are not indicated.

22. p. 75 states 'Mr. Laing is a well qualified actuarian and there is no reason to doubt his certification', but see comment C.(ii).1 above.

23. Final remark: An idea which is often suggested in both the Thomson report and this brief is that scaled volumes vary little from load to load since 'every trip is a "fully loaded truck"'; see comments A.18.2, C.(ii).5 and C.(ii).12. The only information provided on this point are the several reported standard deviations which have all been incorrectly calculated and greatly understate the actual variability; see comments A.18.7 and C.(ii).1.6. In comment C.(i).3, a very rough calculation suggested that the standard deviation of the scaled volumes corresponding to any year of Kyuquot's production might have been about 12 c.m. To get a better idea of what the actual values of the standard deviations reported in the Crawford E. Laing report might be, I asked Mr. Grant to provide me with the Ministry of Forests records of the scaled volumes for the individual loads corresponding to at least one of the booms summarized in Appendix B of the Crawford E. Laing report (page 40 of this brief). The data provided were for boom #K.I. 3 and a summary follows:

Bundle	Pieces	Volume	Bundle	Pieces	Volume	Bundle	Pieces	Volume
1	75	56.0	16	58	48.0	31	75	56.4
2	37	62.2	17	111	78.4	32	39	62.3
3	114	82.6	18	68	90.8	33	68	87.4
4	124	83.8	19	58	51.6	34	39	40.6
5	69	89.9	20	74	52.0	35	42	37.6
6	64	104.5	21	50	77.1	36	101	85.7
7	59	84.9	22	72	84.7	37	51	95.1
8	68	56.1	23	60	76.7	38	48	90.8
9	74	49.6	24	107	88.5	39	61	87.6
10	52	50.5	25	62	89.4	40	60	73.1
11	55	83.1	26	65	55.8	41	49	89.2
12	76	91.1	27	65	92.1	42	59	75.2
13	66	54.8	28	60	87.9	43	8	5.3
14	52	51.5	29	63	100.6	44	47	88.2
15	78	53.9	30	51	70.6	45	52	69.9
						46	76	80.9

Totals: 2962 pieces and 3324.0 c.m.

Note that this summary indicates 46 bundles whereas Appendix B indicates K.I.3 corresponded to 36 loads. The brief notes that K.I.3 included 8 S loads in addition to the 36 L loads which are indicated in Appendix B (see comment C.(ii).11); this brings the total number of loads to 44. Bundle 43 consists of only 8 logs; possibly these represent spillage from one or more of the other bundles. However, that still leaves a discrepancy of 1 between the number of loads as per the brief and the number of bundles as per these Ministry records. Does this discrepancy reflect the splitting of bundles mentioned on page 28 of the brief? Regardless, it is clear that these scaled volumes exhibit considerably more variability than would be suggested by the reported standard deviation of 4.5 c.m. for the data in Appendix B.

To get a better idea what the standard deviation corresponding to the volumes of the 36 L loads of K.I.3 might have been, delete the 10 smallest bundles from the data set (bundles 9, 10, 14, 15, 16, 19, 20, 34, 35 and 43). This leaves 36 bundles which may or may not correspond to the 36 L loads summarized in K.I.3. Nevertheless, in the present context, the standard deviation of these 36 volumes might be expected to be reasonably close to the standard deviation for those 36 L loads. This standard deviation can be calculated to be about 13.4 c.m. If this standard deviation is typical for the L loads within each of the booms summarized in Appendix B, then the standard deviation for the entire set of 316 L loads would be about 14.0 c.m., a value more than three times as large as the reported standard deviation and quite in line with the value of 12 c.m. obtained by a very rough calculation in comment C.(i).3.

(iii) Ministry of Forests

Its review of the contractors' claim has led the Ministry of Forests to the conclusion that 'there is a lack of conclusive evidence to support the contention that a volume of timber has remained unscaled during the period in question' (page 2). The brief presents various documents prepared for the Ministry which review several different aspects of the contractors' claim. Many of the points raised in our review of the Thomson report (document A) are repeated here, but additional information is provided concerning various checks that were carried out.

Detailed comments on this brief follow:

1. pp. 5-7 refer to the three check scales of September 1-4, 1981, September 21-24, 1981 and October 5-9, 1981; Appendix B presents a detailed discussion of the procedures and results. Concerning the first check scale, it is important to note that Shadforth and Woodrow scalers 'had a simpler task' than the Forest Service scalers since they 'did not segregate their logs according to the company grade codes'. Whereas Shadforth and Woodrow scalers presumably simply proceeded along the 'long rows 250 to 300 feet in length' of logs, scaling each log successively, Forest Service scalers were required first to identify whether the log belonged to one of the sort codes for which they had responsibility and if so, then to scale the log. Simply misreading the sort code painted on a log (which might not have been clearly applied by the BCFP log grader) could result in a Forest Service scaler missing a log for which he had responsibility. While the analogy may not be perfect, the task facing the Forest Service scaler, of identifying the logs for which he had responsibility is not unlike asking someone to produce a count of the number of times the letter "e" appears in a paragraph of prose. Repeating this exercise a number of times with the same paragraph of prose will convince anybody that producing an accurate count is difficult. Undercounts almost invariably result, and this would be even more pronounced under time pressure. Similarly, it is not hard to believe that Forest Service scalers would occasionally miss logs for which they had responsibility. The fact that the entire process takes place out of doors, in possibly adverse weather

conditions, and presumably under some pressure to do a speedy job makes this all the more likely.

While not clearly indicated, presumably the five Forest Service check scalers participating in the second check scale scaled by sort code just as the five original Forest Service scalers; this would allow each check scaler to check one particular original scaler. The third check scale also involved an official count of the number of logs and the results confirm that despite that fact 'the original scalers knew they were being check scaled and certainly were doing their best to do an accurate scaling job', they and the Forest Service check scalers 'were both missing logs throughout the five working days'. Whittaker concludes that 'the problem is in the scaling procedure used at this land sort, not the scaling itself'.

2. Appendix C indicates the method used by the Ministry of Forests to determine 'the volume of timber that had not been scaled during the check scale period'. For each check scale period, 'the original Forest Service scalers total volume and total piece count was used to develop a log average'. This log average is then multiplied by an estimate of the number of logs missed in the period to produce the estimate of the unscaled timber.

3. p. 10 indicates that the Ministry's position with respect to the Thomson report is summarized in Appendices D and E. Appendix D argues that there is no reason necessarily to expect load averages to remain constant from year to year and presents some data on 'truck load size from other operations where the scale is not in question'. It is hard to know what to make of this data since no explanatory information is provided. Can this data be verified? Is it relevant?

Appendix D also raises 'the possibility that truck loads were deliberately reduced'. This appears to assume motive to reduce load sizes based on the fact that at least some of the contractors had been advised that BCFP 'expected improved wood recovery' at Shoal Island and that 'contract rates would therefore have to be renegotiated once the anticipated increased scale results were confirmed' (page 17 of Kyuquot's brief). Is there any evidence that truck loads were deliberately reduced? Note that both the Kyuquot and Traer & Mahood et al brief describe contractor loading policy throughout the period in some detail; the Traer & Mahood et al brief explicitly asserts that, in the case of Kyuquot, 'there is no justification for assuming deliberate underloading during the period 1978-80' (page 47(a) of document C.(ii)). Appendix E notes factors, additional to those noted in Appendix D, which might be expected to affect load sizes and states that 'a comparison of actual load size data before July 1978 with 1982 new scaling method data does not support the argument that load sizes remained constant during the 3 1/2 year period of dispute' (page 3), but it is unclear what forms the basis for this statement. Appendix E also points out on page 8 that if the argument of consistent load averages put forward in the Thomson report is accepted, then one might expect the yearly load averages for each contractor to be consistent during the period in dispute, albeit at a lower level. But the yearly load averages for the period in dispute, as reported in the Thomson report, vary considerably for at least some of the contractors (see comment A.19).

4. pp. 10-11 refer to the Whittaker-Burdge comparison of '120 working days prior to October 26, 1981' (actual period: May 4/81 - October 23/81 inclusive) with 'the 120 working

day period following October 26, 1981' (actual period: January 2/82 - June 14/82 inclusive). While Appendix F reports an 8.0% increase in average bundle size (figure should actually be 8.7%), this is not particularly informative. Can this data be split apart according to each contractor, and for each contractor according to the different sizes of trucks the contractor was using? Was no scaling done at Shoal Island between October 26, 1981 and January 2, 1982?

This test seems to be an attempt to assess whether the change in scaling procedures produced an instantaneous increase in volumes scaled (for trucks of the same size). The two month gap in which the available data (assuming some scaling actually took place) was not examined increases the possibility that factors other than the change in scaling procedures might account for the observed increase.

5. Appendix G states that the procedures used at Shoal Island 'functioned without adverse criticism through 1979, 1980 and into 1981' and notes that 'during this period Vancouver supervisors on occasion checked the scale by rescaling immediately after the scaler all the logs in a sort recorded on a tally sheet' (page 2); presumably the results on these check scales agreed well with the original scale. It is important to note that this checking of the scale used the same procedure as the original scale. Agreement of the check scale with the original scale does not necessarily imply the original scale was accurate. If there was a problem with the procedure, agreement simply shows that the problem existed to the same extent with the check scalers as with the original scalers. The check scales described in Appendix

B seem to indicate this was the case. Referring to the check scales of Appendix B, Appendix G states 'there is direct evidence that logs were being missed' and notes that 'both scalers and scaling supervisors recently interviewed ... were of the opinion that there must have been a continuing situation where logs were being missed' (page 4).

6. Appendix H consolidates the data from 'five significant and independent tests of Shoal Island scaling'; in addition to the three check scales of Appendix B, there is the "120 day comparison" of Appendix F and a summary of a 'comparative reanalysis of the Ministry's official scale of 36 random 1979, 1980 and 1981 Shoal out-turn booms versus BCFP sawmill inventory check scales of the same booms' (page 1). Weighted averages of both piece count and volume differences (expressed as percentages of the official scale) are then developed. The reported weighted average of 3.67% based on volume differences appears to be suggested as a reasonable figure for 'issuance of adjustment S & R Invoices' (page 5).

The relevance of all five of these tests and the appropriateness of this figure of 3.67% are not immediately clear. As has already been noted, Ministry check scalers used the same procedure as the official scalers. If the problem was with the procedure, it seems clear that comparison of the volumes scaled by the check scalers and the official scalers provides no information on the volume shortfall and such comparisons should not be included; this affects the treatment of the results of the second and third of the check scales of Appendix B. In any case, these two check scales are of uncertain value here since the fact that Ministry check scales were being

carried out had 'alerted forest service scalers that "something was wrong"' (page 3 of Appendix J). The fourth test, while clearly very relevant, may not be appropriately summarized by the 8.7% figure used here; see comment C.(iii).4 above. The fifth test compares the agreement of BCFP and Forest Service scalers on out-turn booms. What is the nature of these 36 booms? Who are the scalers doing the scaling? What procedures are being used (Shoal Island was a rather unique facility)? If the procedure being used by the official scalers had led them to consistently underscale, is it not possible that over a period of time the scalers doing this work for BCFP had been "conditioned" to scale conservatively so that under normal circumstances their scaled volumes would agree closely with the official scale?

Appendix H states as a 'Ministry in-house impression' that 'Shadforth tends to overscale'. Is there any evidence this is the case? Note that Whittaker, in Appendix J, makes no such suggestion.

7. Appendix I presents a more detailed summary of the results of the "120 day comparison" and raises the question of why 'the company operation increases are considerably less than the percentage increases of the contractors' (page 2). The difficulty of interpreting this data due to the use of different sized trucks is noted. Appendix I also presents data on average size of logs for Kyuquot and Traer & Mahood during the period 1976 to 1981 and suggests that Traer & Mahood's 'reduced volume in 1981 is due to smaller, not fewer, logs' (page 3). Would smaller logs necessarily lead to reduced load sizes?

8. Appendix J presents Whittaker's opinion as to whether or not a shortfall in volume occurred during the period in dispute. In reference to the first of the check scales of Appendix B, he indicates that he thinks neither Shadforth nor Woodrow was 'biased in favor of the company that hired him'. He also states 'To me there is a sufficient number of indicators to suggest a shortfall in total logs scaled and total volume scaled was not an isolated incident, but rather, began at the start-up of Shoal Island and continued until recording and other procedures were changed'.

9. Appendix K, the Kozak-Smith report, presents many of the same comments which have already been made concerning the Thomson report and goes on to present somewhat different summaries of the information provided in Appendix H. The summaries presented depend on all but the fourth test ("120 day comparison") and are dominated by the fifth test which involved by far the greatest quantity of timber; see comment C.(iii).6 above. The report goes on to present some information on the variability of scaled volumes corresponding to "full" bundles. A particular set of 177 "full" bundles had scaled volumes ranging from 31.5 c.m. to 106.5 c.m.; this represents even greater variation than that reported in comment C.(ii).23.

10. Final remark: The brief states that 'the only verifiable criticisms of the scale results at Shoal Island are based on discrepancies in piece count' (page 13). This statement appears to be based on the fact that whereas an official piece count (presumed exact, or at least essentially so) was obtained during the check scale of October 5-9, 1981, such an accurate assessment of scaled volume was not available for any of these check scales.

The brief concludes that 'because of the lack of verifiable data the Ministry ... is unable to determine whether there has been a volume of timber unscaled'. Yet the report accepts as fact that some logs were missed (at the very least during the period of the check scale of October 5-9, 1981, but see also page 7 of the brief). Those logs that were missed were not scaled. It would seem to follow immediately that there was a volume of timber that was unscaled; namely, the volume corresponding to the missed logs. Although it is possible that logs not missed were overscaled leading to the scaled volume assigned to all logs delivered being larger than the value that would have been assigned by an accurate scale, this possibility seems unlikely since no party has questioned the competence of the scalers. Such an argument might be made to support a conclusion of a lack of verifiable data demonstrating an underscale during the period in dispute. In fact, this is the conclusion the brief seems to be suggesting when it states 'variations in piece count do not necessarily lead to identifiable variations in volume' (page 13).

(iv) British Columbia Forest Products Ltd.

In this brief, BCFP challenges the adequacy of the data from the check scales carried out by Shadforth in May, June and July 1981 and by both Shadforth and Woodrow on September 1-4, 1981 as a basis for an allegation that 'significant errors in scaling were made by British Columbia Forest Service scalers at Shoal Island'. Since details concerning the first of these checks scales have never been presented, discussion will be restricted to the September 1-4, 1981 check scale. The brief points out that in order to provide support for the allegation that logs were being missed, 'it must be assumed that the piece

counts obtained as a result of the check scale were correct and the Forest Service piece counts were wrong' (page 3) and goes on to state that no 'compelling reason has been advanced why it (this assumption) should be accepted'. This position heavily discounts the following facts:

(a) Shadforth and Woodrow used a simpler procedure which might be expected (all else being equal) to produce more accurate piece counts,

(b) Shadforth and Woodrow (presumably acting independently) obtained comparable piece counts which differed noticeably from the official scale,

(c) the results of the subsequent check scales on September 21-25 and October 5-9, 1981 displayed the same pattern of low piece counts on the official scale; the last check scale established that, at least on that occasion, both the original Forest Service scalers and the Forest Service check scalers were missing logs.

The brief points out that even if this assumption were accepted, to use the results of the check scale to impute a volume shortfall for the entire period in dispute requires the further assumption that 'a similar result would have been reached had Mr. Shadforth checked all of the booms processed at Shoal Island prior to October 26, 1981' (pages 3 and 4).

The brief questions the wisdom of making an inference concerning 1370 booms from an inspection of 4 of those booms and likens this to a decision that 'all the vehicles on the streets of Vancouver were Volkswagons because the first four vehicles encountered on entering the city happened to be of that make'. This anology is a poor one; a better one would be

a decision that a particular bathroom scale would lead to biased assessments of the weights of each of a group of 1370 individuals if this happended to be the case for 4 of those individuals who had been chosen in order to test the bathroom scale before proceeding with the weighing of the remaining 1366 individuals. The point is that it is not the booms but the procedure by which the booms are scaled that is being tested. Of course, one would want to examine the check scale data carefully for consistency of the pattern from sort to sort, boom to boom and especially scaler to scaler (the data may not be available in a form which would permit this). The critical question would then be whether or not the procedures used at Shoal Island were the same throughout the period in dispute.

The brief goes on to present the results of check scales of 151 outgoing booms from Shoal Island during the period in dispute, but the relevance of this data is unclear; see comment C.(iii).6. The brief reports considerable discrepancies in piece counts between the official scale and check scale on individual booms but notes that these tended to "cancel out" in the aggregate. The brief interprets this variability as suggesting 'that it is not surprising that Mr. Shadforth should have found discrepancies of approximately 11% (referring to the check scale of May, June and July 1981) and 6% when he conducted his checks' (page 8). But these are not check scales carried out by Shadforth at Shoal Island. In fact, it seems clear that these check scales were carried out at many different locations, by many different scalers and with possibly many different procedures. The relevance of this data remains to be determined.

(v) B.C. Government Employee's Union

This brief appears tangential to the main argument and I feel no need to comment on any aspect of it.

D. Responses Submitted at the Inquiry

(i) Traer & Mahood Contractors Ltd. et al

This response consists of three parts: the first is a restatement of the position previously adopted in the Traer & Mahood et al brief, the second comments on the BCFP brief, and the third comments on the check scales described in Appendix B of the Ministry of Forests brief.

Detailed comments on this response follow:

1. Tab 1

1.1 p. 2 and elsewhere refers to 'a policy letter of March 19th, 1983'. Does this refer to the May 19th, 1983 Apsey memorandum (Appendix G of Ministry of Forests brief)?

1.2 p. 5 states that 'except for variation in cedar content isolated in the data, the load average is consistent'. The consistency of load averages has not been convincingly demonstrated, even for the period not in dispute (see comments on Traer & Mahood et al brief); essentially no evidence has been provided for the period in dispute. Nor has it been demonstrated that cedar content is the only factor affecting load averages.

1.3 p. 5 states 'the data shows no variation in the CEL Factor from 1975 to 1984'. This statement appears to be based primarily on the 1975 to 1978 Kyuquot data (which exhibited a consistent CEL Factor of about .939; but see comment C.(ii).7 concerning the 1978

data) and the 1982 to 1983 Traer & Mahood data (which exhibited a consistent CEL Factor of about .787; but see comment C.(ii).1.2) presented in their earlier brief. Essentially no information appears to be available on what CEL Factors might have been during the period in dispute.

1.4 p. 6 states that 'the statistician's certificate relates to the stability of the mean so determined', but see earlier comments on the Crawford E. Laing report. The person preparing this report appears to have a limited understanding of even the most elementary statistical concepts; most of the conclusions drawn are simply not supported by the data considered and the calculations carried out.

1.5 pp. 6-7 states that 'the CEL Factor of 0.787 ... has been applied to 18,000 loads. Accuracy of the factor is at all times within the 3.0% allowed for scaling'. How does this figure of 18,000 arise? Note that the "verification" of the CEL Factor provided in Table I of the previous brief leaves much to be desired; see comment C.(ii).7.

1.6 pp. 7-9 attempts to draw an analogy between the procedure used by a Professional Forester to estimate timber volume in a given region and the procedure that would be used to evaluate the CEL Factor for the truck loads of timber removed from that region. The Forester measures all timber standing on each of a number of sample plots; the particular plots chosen are determined by a random mechanism. Knowledge of the properties of this random mechanism allows the data from the sample plots to provide an estimate of

the total timber volume in the region which has known statistical properties. In particular, the volumes from the individual sample plots provide information on variability which allows an assessment of the precision of the estimate. It is the random mechanism which allows the Forester to make the desired inference from the sample to the population, the set of all possible plots from which the sample plots are drawn. Without strong assumptions, it is not possible to use this data to make a statistical inference about the total timber volume in other regions, or in the same region at some other point in time.

As described here, the procedure used to evaluate the CEL Factor would record the cross section for each truck load and obtain the total S & R volume corresponding to all truck loads. The CEL Factor is then the S & R volume divided by the total cross section utilized. If the trucks are all of the same cross section, the CEL Factor is simply the load average for all truck loads divided by this cross section. Since the data for all units of the population (the set of all truck loads from this region) is available, this calculated CEL Factor is exactly the CEL Factor for the population. No estimation is being carried out, and in this context no assessment of precision of this CEL Factor makes any sense. Clearly, this CEL Factor is particular to this population (this set of truck loads); there is no particular reason to expect the same CEL Factor to apply to other populations (other sets of truck loads) that might be of interest.

Note that it also makes sense to talk about CEL Factors for individual truck loads. Indeed, it might be of some interest to know how the CEL Factors for the individual loads in the above population vary around the CEL Factor for the population; such information is never provided.

2. Tab 2

2.1 p. 1 makes various claims concerning what Shadforth 'proved'. Where is the evidence supporting these definitive statements?

2.2 pp. 2-6 question the relevance of the check scales reported in the BCFP brief since these are outflow rather than inflow booms, the booms appear to consist of larger logs on average than the profile taken from the forest (What is the source of the data on forest profile average piece on page 3?), these booms may not be representative of all outflow booms in a given year, and the procedures may differ from those used at Shoal Island.

2.3 p. 4 states that 'out of 109 booms sold to outsiders, 75 or 69% had rescale volumes exceeding the allowable limits for scaling error', but this statement cannot be verified from the BCFP check scale data since no data is provided for individual booms. What can be said is that in 3 out of the 4 years, the aggregation of all booms sold to outsiders for which data is presented had rescale volumes differing by more than 3% from the Ministry of Forests scale; 75 out of the total of 109 such booms were rescaled in those 3 years.

3. Tab 3

3.1 p. 4 presents a 'professional anaysis' of the data on the check scales which, it is stated, shows that 'Mr. Whittaker's adjusting invoices were ... understated' (page 5). What is the source of the data which allows the calculation of "% underscale of the contractors' delivery"? Whittaker indicates very clearly in Appendix C of the Ministry of Forests brief how he arrived at his adjustments; see comment C.(iii).2. The second row of this table presents a slightly different calculation of the appropriate adjustment based on the assumption that Shadforth's scaled volume was correct (for the first two check scales; it is not clear how the 3.2% figure for the third check scale was obtained).

3.2 p. 5 refers to BCFP participating as "official counter" in the second check scale, but I find no reference to BCFP participating in such a capacity. Whittaker merely states that 'BCFP also selected one of their employees to do a piece count of the logs as they were spread for scaling' (page 2 of Appendix B of Ministry of Forests brief).

3.3 p. 9 claims that 'when Shoal Island was not under check scale ... anything could happen - underscale averaged about 13-14% with erratic variation upwards of 25% on individual booms'. Where is the data supporting this claim?

3.4 pp. 11-12 considers 'data in the Whittaker report', but Case 3, which previously in this response referred to the check scale of October 5-9, 1981,

does not appear to correspond to any data previously reported.

(ii) Ministry of Forests

On the issues being addressed, this response consists mainly of comments which have already been made in this review and will not be repeated here. A few detailed comments follow:

1. p. 5 notes that 'supervisory checks on log scalers at dry land sorts ... conducted on an ongoing basis ... gave no indication of any serious problem with respect to scalers missing logs. Approximately 20 similar checks were conducted at Shoal Island in the period 1978 and 1979 with similar results', but this may only show that the problem existed to the same extent with the supervisory personnel as with the original scalers; see comment C.(iii).5.

2. p. 9 suggests that the Apsey memorandum (Appendix G of Ministry of Forests brief) 'referred only to the brief check scale period in the fall of 1981' when stating on page 4 that there was direct evidence that logs were being missed. The response states that 'the statement should not be taken as any concession that logs were missed over a longer period'. But on that same page Apsey notes 'both scalers and scaling supervisors recently interviewed ... were of the opinion that there must have been a continuing situation where logs were being missed' and goes on to say 'the difficulty then, as now, is one of deciding on how large a volume was in fact missed outside of the check scaling period'. This certainly seems to accept the premise that logs were being missed outside of the check scaling period.

3. p. 16 suggests that 'the truck-load average system is used for provisional estimates only' and this seems to agree with the utilizations mentioned on pages 16 and 17 of document C.(ii).

4. The references to cross sections on pages 16 and 19 appear to fail to recognize the apparent distinction between "cross section" as used in the Thomson report and the Traer & Mahood et al brief; see the initial discussion of the latter document.

(iii) British Columbia Forest Products Ltd.

In this response, BCPF criticizes the key assumptions of the methods proposed to evaluate the volume shortfall in the Thomson report and the Traer & Mahood et al brief; many of these comments have already been made in this review and will not be repeated here. A few detailed comments follow:

1. p. 3 claims that 'the larger the portion of pulp wood harvested the lower is the volume of timber scaled for a given volume of wood' and notes that yearly 'portion of pulp wood varied through the relevant time periods'. The data provided in Tab 1 suggest that the portion of pulpwood was considerably larger in 1980 and 1981 than in other years (the figure 10,065 c.m. for pulp in 1979 appears to be incorrect). What is the source of this data? Can it be verified? The response suggests that if all other factors remained unchanged, lower average loads would result from the asserted 'deliberate policy in 1979 and 1980 to take more pulp wood', but no evidence is provided that the first claim is true. Is it self-evident?

2. pp. 3-4 mention a number of factors which might affect the volume of timber in a particular truck load: circumstances of loading, length of logs, species mix and size mix. While all of these factors might be expected to contribute to variability in the individual truck load volumes, their impact on yearly truck load averages is unclear. It might be argued that these factors would "average out" over the course of a year. Of course, if such an argument is to be made, some evidence supporting it would be desirable.

   It is a little unclear what to make of the data presented in Tab 3. Since volume corresponding to only a single truck load of each of thirteen different types is reported, no assessment of the variability within types is possible; this makes it difficult to assess the observed variability in volumes corresponding to the different mix of sizes of wood for each type of truck load.

   Note that in Tab 3 the "end area" for a flat load is what is referred to as the "cross section" in the Traer & Mahood et al brief. On the other hand, the method of calculating the "end area" for a peaked load (end area = 1.5 x cross section) appears to bear little resemblance to that employed in the Thomson report. Note that only "cross sections" are employed in the Traer & Mahood et al brief.

3. p. 7 claims that 'the CEL Factor depends on the size of truck'. It is unclear whether the argument is that the CEL Factor would be larger or smaller for larger trucks. That 'the ratio of load volume to load perimeter is larger on a large truck than a small one' seems to argue for the former, while 'there will ... be a greater proportion of

short logs in a large load than in a small load' seems to argue for the latter. In any case, what evidence is there supporting the claim? Note that CEL Factors for the flat loads described in Tab 3 are larger for the larger truck loads of each size mix. On the other hand, the 1982 and 1983 Traer & Mahood data (Appendix II of the Traer & Mahood et al brief) showed essentially identical CEL Factors for two different sized trucks (but see comment C.(ii).1.2).

4. p. 8 cites the COFI Report at Tab 4 as evidence that 6% 'was not the amount of sinker loss accepted in the industry' and suggests the figure 1.45% from the table on page 12 of that report as the amount that sinker loss was thought to be in 1980 for Agamemnon Channel. It is hard to know what to make of this table. On what evidence are these figures based?

5. p. 8 claims 'there is support for the proposition that water scaling overstated timber volume' and notes that a letter dated September 26, 1979 from Kyuquot Logging Ltd. to BCFP (Tab 7 of Kyuquot brief) states that with dry land scaling 'the scalers are having a better look at the wood and are scaling accordingly (consistent load over-runs have virtually disappeared)'. What is the 'support for the proposition'? Does it consist entirely of this remark? This remark certainly raises the possibility of overscale prior to the start-up of Shoal Island, but the Kyuquot brief clearly refers to this as a speculative explanation of the decline in their load averages (page 18 of Kyuquot brief). Also note that the 'consistent load over-runs' refer to the differences between the nominal yearly load averages arising from Kyuquot's estimating system and the actual yearly load averages. There is no

implication in this phrase that the scaling prior to the start-up of Shoal Island had produced a consistent overscale since 'Kyuquot planned its estimates so that actual scale returns would result in a 12-13% overrun of its camp estimate' (page 12 of Kyuquot brief).

6. p. 8 refers to the results of the experiment described at Tab 5 'which indicates that a smaller volume of timber will be scaled in the same pieces when they are scaled on land than when they are scaled in the water'. In fact, the results of the experiment were that 'with 3% less pieces scaled in the water virtually the same volume of timber was scaled' (page 1 of Tab 5). It is a little hard to know what to make of the results of a single such experiment; by how much would the results change if the entire experiment was repeated? Note that the bundle summary provided on page 2 of Tab 5 allows calculation of the standard deviation of the scaled volumes corresponding to the 33 bundles in this boom. This standard deviation of 14.2 c.m. agrees quite well with previous attempts to assess bundle-to-bundle variation within a boom; see comments C.(ii).23 and C.(i).3.

E. Minutes of the Inquiry

The oral arguments presented at the inquiry primarily reiterate the arguments presented in the responses submitted at the inquiry (documents reviewed under D above, but note that no such response was received from Kyuquot). Very little new information is brought forward; the major exception is the data on load averages and percent pulpwood reported graphically in the presentation on behalf of British Columbia Forest Products Ltd. Points which have already been raised in this review will not be repeated here. Some detailed comments follow:

(i) September 28, 1984

1. British Columbia Forest Products Ltd.: Wallace & Gouge

1.1 pp. 12-18 presents graphical data on the relationship between bundle size and percent pulp volume over time for individual contractors operating in particular locations. The graphs provide an indication of the variability in bundle size and percent pulp volume which is masked when only yearly averages are presented, but it is unclear exactly what is being plotted on these graphs. Page 13 suggests it is the 'load by load' bundle size and percent pulp volume, but it is not clear such data would be available for the period prior to October 26, 1981. It seems more likely that the data points being plotted correspond to average values for all loads in a boom or maybe even several booms; the data points corresponding to the individual loads would exhibit even more variability. In any case, what is the source of this data? Can it be verified? Recall the assertion of

the Traer & Mahood et al brief that 'bundles were split in several parts at Shoal Island resulting in more bundles scaled than delivered'; see comment C.(ii).10.

One aspect of these graphs is the interpretation of the relationship of the 'six sort moving average' plots; the summary presented is sometimes too simplistic. For the first of these graphs (Tom Browne Lake: Dougan), for example, the claim is 'the tendency of the six sort moving average bundle volumes is taking a curve in exactly the opposite direction' as the six sort moving average percent pulp volume (page 14). In fact, a careful look at these two plots reveals a considerably more complicated situation: both plots remain essentially constant until about the end of 1978; then the plot for bundle volumes decreases while that for percent pulp volumes increases until early 1980; then both plots decrease until mid-1981; then both plots increase until early 1982; finally the plot for bundle volumes increases while that for percent pulp volumes decreases until the end of 1983. The ends (both the beginning and the ending) of such moving average plots can be misleading (How were six sort moving averages calculated at the ends?), and we are left with a somewhat uncertain notion of the overall relationship between bundle size and percent pulp volume. The relationship between these two variables over this period of time would be more clearly presented by a graph of bundle size versus percent pulp volume; individual points could be labelled with their corresponding dates (or position in the time sequence) to reveal the temporal pattern. While

there does appear to be some indication of the suggested negative association, the graphs are not entirely convincing. The negative association seems quite clear in the Phillips Arm: Cox graph, but note the positive association suggested in the Wakeman Sound: BCFP graph.

On the other hand, these six sort moving average plots are very helpful for identifying the general trend of both bundle size and percent volume over time. The pattern of bundle size over time is particularly relevant to the argument being put forward by the contractors, and much more detail is presented here than has been provided earlier. Note, however, that the bundle sizes presented here corresponding to the period prior to the start-up of Shoal Island presumably contain no adjustment for sinkage; if the 6% adjustment was included, this would have a noticeable effect on these plots.

1.2 pp. 18-19 presents three graphs plotting 'average bundle size' versus 'percentage of pulp volume' in the form suggested in the comment above. I have not been provided with these graphs. The presentation does not clearly indicate what data is plotted on these graphs, other than it is 'the same load information'. Was the data corresponding to more than one of the previous graphs plotted on a single one of these graphs?

1.3 pp. 19-20 clarify that the data correspond to averages for 'each camp run delivered to Shoal Island; see comment 1.1 above.

1.4 pp. 24-25 note that the predictions of volume delivered based on CEL Factors in the Traer & Mahood et al brief occasionally fail to lie within 3% of the actual scale in years which are not in dispute.

1.5 pp. 28 notes that BCFP records indicate cedar content as 42.2% for the 1237 bundles delivered to Shoal Island by Cox in 1983. If this is correct, the 'linear trend line fitted using least squares' on page 49 of the Traer & Mahood et al brief would change dramatically (Cox's 1983 deliveries to Shoal Island appear as data point (3) on this figure); indeed, it is no longer clear whether a straight line is a good summary of the six data points under consideration.

1.6 pp. 28-33 carries out estimations of volume based on CEL Factors for that part of Cox's 1983 data which remains after the 161 bundles 'consisting only of cedar logs' (page 28) are removed. These calculations assume that the correct scaled volume and cedar content for all 1237 bundles are 108,659 and 42.2% respectively. But if the correct cedar content is 42.2%, all CEL Factors would change (see comment 1.5 above) and these calculations are not particularly relevant.

Suppose, however, that 53.3% <u>is</u> the correct cedar content. Then the calculation corresponding to that described for column BCFP No. 1 can be carried out as follows: 53.3% of 108,659 = 57,915; 57,915 - 15,745 = 42,170 c.m. of cedar corresponding to the 1076 bundles, or 45.4% cedar content. 45.4% cedar corresponds to a CEL Factor of .854, as obtained from

the 'linear trend line fitted using least squares'. This leads to an estimated volume of .854 x 1076 x 98 = 90,053 c.m. which is 2,861 c.m. or 3.1% (2,861 ÷ 92,914 x 100%) below the actual scaled volume.

1.7 p. 36, in referring to the results of the experiment described at Tab 5 of the BCFP response, states 'when the logs are on the land you get a better look at them and in fact scaling is not worse as alleged by the contractors; it's better'. How do the results of this experiment support the claim that scaling is "better" on land? All that has been shown is that for this particular boom fewer pieces were counted in the water scale than in the land scale while the volumes scaled were virtually identical. Since actual number of pieces and the actual volume are unknown, how can one of these sets of results be claimed to be "better" (presumably by this is meant more accurate) than the other?

2. Traer & Mahood et al: Webster & Mulholland

2.1 p. 47 repeats the point that 'loads are not bundles' (see comment C.(ii).10) and goes on to state more explicitly that 'the machinery at Shoal Island would only accommodate a certain weight and on occasion for the larger bundles they had to be broken into two'. If this was the case, were records of this kept? Can the counts of truck loads and bundles be reconciled? The report goes on to state that 'the truck is a container, a container carries a volume, the volume can be measured'. Were volumes of individual trucks loads actually measured prior to October 26, 1981? No such data has been presented.

2.2 p. 53 claims 'the system at Shoal Island created pieces. One piece of wood could become two logs or three. There was cutting going on all the time'. If this was the case, piece counts obtained from the scale would not necessarily be expected to agree with records of piece counts kept by the contractors, nor would the average sizes per piece. However, provided that any cutting took place prior to all scaling, this has no bearing on the discussion of the agreement of the scale with the check scales as assessed by piece count.

2.3 p. 60, in referring to the data presented in the Thomson report, states 'Mr. Hutchings in his letter of March 2, 1984, Appendix D of the Ministry brief, agrees that the data is correct', but in fact what is said is that 'the report accurately describes the contractor records' (page 1 of that Appendix).

3. Kyuquot Logging Ltd: Kirkham

3.1 p. 81 mentions the work carried out by Shadforth in May to July 1981 'who reported an 11% under-scale'; see comment D.(i).2.1. What were the procedures used by Shadforth at this time? Is the data available?

3.2 p. 82 notes Whittaker's figures for the check scale of September 1-4, 1981 (page 3 of Appendix J of the Ministry of Forests brief) of 7.6% and 4.34% (actually 4.4%) corresponding to Shadforth and Woodrow respectively and suggests these should instead be 8.2% and 4.6% respectively. Whittaker is very clear in both Appendix B and J of that brief; he is expressing the "shortfall in total volume scaled".

If he assumes Shadforth is correct, the actual shortfall is 9586.1 - 8860.0 = 726.1 c.m. Expressing this as a percentage of 9586.1 c.m. (assumed to be the correct scaled volume), he obtains 726.1 ÷ 9586.1 x 100% = 7.6%. Similarly, if he assumes Woodrow is correct, he obtains 4.4%. The suggested figures are obtained by evaluating the extra volume obtained as a percentage of the official scale; for Shadforth, 726.1 ÷ 8860.6 x 100% = 8.2% and similarly, for Woodrow, 4.6%. The two sets of figures represent <u>different</u> quantities; neither is "wrong".

3.3 p. 85 points out that the Whittaker-Burdge "120 working day" comparison (Appendix F of Ministry of Forests brief) includes the period of the three check scales in its "120 working day" period prior to October 26, 1981. As a result, the observed difference could well be smaller than would otherwise have been the case.

4. <u>Ministry of Forests: Clancy & Leadem</u>

4.1 pp. 124-125 draws attention to a comparison of the experiences of Dougan and Cox, but the conclusion that 'truck load averaging doesn't give consistent results so far as volume is concerned' ignores the distinction that has been made in the Traer & Mahood et al brief between the effect of cedar content for high and low stakes loading.

4.2 p. 126 notes the considerable differences between shortfall estimates presented in the Thomson report and those reported in the Traer & Mahood et al brief and states that 'the change is partly attributable to

a change in cross sectional area'. Other reasons for the change are the incorporation of a dependence on cedar content into the calculations and the fact that for some contractors estimates are now being made in some years where none were attempted in the Thomson report.

5. B.C. Government Employee's Union: Heyman

- no comments

(ii) September 29, 1984

1. British Columbia Forest Products Ltd.: Wallace & Gouge

1.1 pp. 145-146 clarifies what data was being presented in its figures: volumes are taken from the official scale and load counts are 'taken from the contractor's own records'. This still does not indicate how the percent pulp values were determined. See comment E.(i).1.1.

1.2 p. 150 argues that since 'no one has advanced to you any reason to believe that the error of the scalers, if there was one, was in any way selective', it follows that 'you must assume that if there was an error, it was random across all of the various straits and species'. The second statement does not logically follow from the first. Absence of information concerning some phenomenon does not force one to make what amounts to a strong assumption about that phenomenon. One may choose not to make any assumption, but rather to reserve judgement until further information becomes available. Incidently,

if the data corresponding to the check scales of September 1-4 and 21-25, 1981 was available in a detailed enough form, it might provide some information on this point.

1.3 p. 151 states that 'the first Thomson report ... assumed that the scaling error ... was uniform throughout all sorts of logs and throughout all contractors'. I can find no such uniformity assumption being made in the Thomson report (except for the 6% adjustment for sinkage). If such an assumption had been made would the estimated volume shortfalls not be simply a fixed percentage of the official scaled volumes?

1.4 p. 152 notes that 'logs were bucked at Shoal Island', but states that 'all bucking at Shoal Island was done before logs were scaled'; see comment E.(i).2.2

2. Traer & Mahood et al: Webster & Mulholland

2.1 p. 160 states 'the Thomson report had measurements of trucks solely to determine that they were different, that is, that there were large trucks and small trucks, not to determine the exact cross-sectional size'. While the Thomson report never dealt with "cross sections", many of the calculations depended critically upon the "end areas" which are determined, at least in part, from truck measurements; see the discussion of the Thomson report.

2.2 pp. 161-162 explain that the CEL Factor is simply the total volume divided by the total cross section; the values .787, .786, .787 and .787 are obtained for the

Traer & Mahood 1982 and 1983 data displayed in Appendices A, B, C, and D respectively of the Crawford E. Laing report (Appendix II of Traer & Mahood et al brief). The value of .787 is then used as the CEL Factor for all contractors using low stakes loading (Traer & Mahood, Cox, Reid) in any year in which their cedar content was 26% or less. Yet, for example, if one calculates the CEL Factor for Reid in 1976, 1977, 1978 pre Shoal Island, 1982 and 1983 from the production data provided on page 50 of the Traer & Mahood et al brief according to the above description, one obtains values of .793, .812, .839, .809 and .752 respectively rather than the value .787 which is assumed to apply. How is this assumption of a constant value of .787 reconciled with the above and with the statement 'of course the CEL factor changes. It is by its nature a changing, shifting, moving thing. It changes according to the variables that we have said' (page 162)? See also comments C.(ii).1.2 and C.(ii).15.

2.3 p. 170, referring to the graphical data presented by BCFP, states that 'the graphs do not show the correlation claimed' and 'the moving average graph has no merit'. I do not understand the basis of the second statement. While some caution is advisable when interpreting moving average graphs, they are helpful in identifying general trends. The 'correlation claimed' is difficult to assess due to the manner in which this data has been presented; certainly the 'correlation claimed' is not obvious in some of the graphs. See comments E.(i).1.1 and E.(i).1.2.

3. B.C. Government Employee's Union: Heyman

- no comments

4. Kyuquot Logging Ltd.: Kirkham

4.1 pp. 173-174 notes that 'the drop off of Kyuquot ... was most pronounced throughout 1979' but 'the percentage of Shoal Island production which was utilized for pulp in 1979 was not untoward'. While this may suggest that the shortfall Kyuquot experienced was not related to pulp, it hardly 'proves' this was the case since the yearly percentage of pulp at Shoal Island is not directly relevant. The relevant data would be the percentage of pulp in Kyuquot's production compared to Kyuquot's load averages, preferably on a load-by-load basis. One of the graphs presented by BCFP provides such data for Kyuquot at Knight Inlet on a camp run basis and clearly indicates that the percent pulp for camp runs corresponding to mid 1980 on this figure are substantially higher (in the range of 30%-45%) than values corresponding to before 1980 on this figure. This appears contrary to the claim that in 1980 Kyuquot 'was not producing more pulp than it had been before' (page 174), but see comment 5.1 below. Incidently, throughout this section reference is made to 'truck load count' where presumably 'truck load average' is meant.

5. Ministry of Forests: Clancy & Leadem

5.1 p. 191 states very clearly that what wood is designated as pulp wood may vary from one time period

to another simply due to market demand. As a result, even if the correlation claimed by BCFP in its presentation was clear, there would still be some doubts concerning the proposed explanation of 'a deliberate policy to log or produce pulp wood' as being 'responsible for the 1979 to 1981 change in the truck load average'.

F. Letter of D.B. Kirkham

This letter clarifies how the imputation of volume shortfall on page 23 of the Kyuquot brief was carried out and corrects the failure of that imputation to split the 1978 data into parts corresponding to the periods not in dispute and in dispute. The imputation uses a simple average of the 1975, 1976 and 1977 yearly load averages (a weighted average as was used in the Thomson report would lead to almost the same result due to the consistency of the yearly load averages over this period) and does not incorporate the 1978 pre-Shoal Island data into the load average used in the imputation; see comments A.18.3 and C.(ii).7. Both the Thomson report and the Traer & Mahood et al brief report the 1978 pre-Shoal Island scaled volume for Kyuquot as 40,450 c.m., but here it is determined by multiplying the total 1978 scaled volume by 26.5% leading to 40.625.3 c.m. (in all previous references the 26.5%, 73.5% split appeared to refer to numbers of loads not volume). In this letter Kyuquot again reports its number of 1978 loads as 2519 in agreement with page 13 of its brief. This contrasts with the figure of 2485 used in the Traer & Mahood et al brief; see comment C.(ii).7. It is curious that while much of the Kyuquot brief argues for the validity of its estimating system based on full and half loads, that estimating system is not used in the imputation of the volume shortfall; see comment C.(i).9.

III. SUMMARY AND CONCLUSIONS

What can then be concluded concerning the positions of the various parties? Kyuquot Logging Ltd. claims that 'the evidence of underscale at Shoal Island is overwhelming' and goes on to present 'nine separate points ... as support of the proposition that the evidence is overwhelming' (page 73 of minutes). Chief among these is Kyuquot's experience with its estimating system, but also cited are 'the Shadforth scales that were done early in 1981' (page 81 of minutes), the check scales of September 1-4, September 21-25 and October 4-9, 1981, and the Whittaker-Burdge "120 working day" comparison. Traer & Mahood Contractors Ltd. et al claim similarly that 'it is beyond argument that a significant volume of timber was not accounted for at Shoal Island' (page 24 of their brief). Although the main argument made in support of this position is the difference of scaled volumes during the period in dispute from those anticipated on the basis of CEL Factors being consistent throughout except for the necessary adjustments for cedar content, many of Kyuquot's points are also cited by Traer & Mahood et al.

Contrasted with this position are the positions of BCFP and the Ministry of Forests. Based on the results of the check scales of 151 booms presented in its brief, BCFP concludes that 'the scaling of timber at Shoal Island in the relevant period was accurate within the accepted statutory limits and that all timber was scaled' (page 11 of BCFP response), thereby denying the existence of any problem. The Ministry of Forests comes to an intermediate position, concluding that 'there is a lack of conclusive evidence to support the contention that a volume of timber has remained unscaled during the period in question' (page 2 of Ministry of Forests brief).

What can be concluded concerning these positions from the quantitative evidence presented? The Ministry of Forests' position seems somewhat at odds with its own brief; see comment C.(iii).10. The relevance of the check scale data presented by BCFP is unclear; little if any additional

evidence has been presented in support of BCFP's position. The principal arguments put forward by the contractors concern consistency over time of certain quantities: load averages in the Thomson report, performance of an estimating system in the Kyuquot brief, and CEL Factors in the Traer & Mahood et al brief. Yet questions remain concerning the availability and/or accuracy of necessary data in some instances. The evidence of consistency for the period not in dispute is not particularly definitive. Further, and most importantly, no direct evidence is presented concerning what the quantities of interest might have been during the period in dispute; no such evidence could now be obtained. These arguments are unconvincing since they reduce to a very strong assumption of consistency over time.

Nevertheless, there is additional quantitative evidence which seems to provide conclusive evidence of a volume of timber remaining unscaled at Shoal Island. This is the data resulting from the various checks: Shadforth's scales of May, June and July 1981, the check scales of September 1-4, September 21-25 and October 4-9, 1981 and the Whittaker-Burdge "120 working day" comparison. Since the procedures employed in Shadforth's scales of May, June and July 1981 have never been reported, their relevance remains uncertain. Various difficulties with crude summaries of the "120 working day" comparison have been noted; whether this comparison provides useful information is unclear. There remain the three check scales of September 1-4, September 21-25 and October 4-9, 1981.

With the possible exception of BCFP, all parties appear to accept these check scales as definitive evidence that 'logs could be missed with the procedures then in use by the Ministry of Forests' scalers at Shoal Island' (page 7 of Ministry of Forests brief). In light of the apparent pattern of low piece counts on the official scale on each occasion, the apparent improvement over occasions and the verification provided on the final occasion, this conclusion seems inevitable. The presentations have drawn the distinction from time to time between the number of pieces and

the volume of wood. The important point here is that if logs were missed, then the volume of those logs is not included in the scale. It follows that there was a volume of timber unscaled; namely, the volume corresponding to the missed logs.

BCFP, when referring to Shadforth's scales of May, June and July 1981 and the check scales of September 1-4, 1981, claims that 'the check scale evidence ... is hopelessly inadequate to draw any inference as to the accuracy of the scaling in the period in question' (page 9 of BCFP brief). This objection appears to be concerned mainly with the possible difficulty of inferring that 'a similar result would have been reached had Mr. Shadforth checked all of the booms processed at Shoal Island prior to October 26, 1981' (pages 3-4 of BCFP brief; but see the review of this brief).

All parties express this same concern. The Ministry of Forests states that 'discrepancies in piece count were based on a very small sample and would not necessarily apply to the volume scaled over the entire period in question (page 13 of Ministry of Forests brief). Traer & Mahood et al argue that 'that check scale does not predict accurately what happened before the check scale' since 'the check scale eliminated even at the time it was being made, certain errors' and this was so even for 'the first one which we suggest is probably the best one' (page 50 of minutes). Kyuquot notes that 'it's not necessarily the case that the Shoal Island procedures were equally bad at all times' (page 81 of minutes) and argues similarly that although 'the September 1st to 4th scale was the best', this scale 'understates the magnitude' of 'a serious problem at Shoal Island' (page 82 of minutes). In summary, the Ministry of Forests appears concerned primarily about the difficulty of extrapolating from data in a small time period to a much larger period of time while the contractors are also concerned that the results of the check scale may understate the magnitude of the problem.

If the conclusion that 'logs could be missed with the procedures then in use by the Ministry of Forests' scalers at Shoal Island' is accepted, the question becomes: How can the volume corresponding to the missed logs be estimated? Traer & Mahood et al argue that 'you can't use any of those scales to prove what happended before the scales. You have to find out what was harvested' (page 67 of minutes) and propose the method of their brief to accomplish this. In its brief, Kyuquot seemed to propose the use of its estimating system to accomplish this, but then used the method of the Traer & Mahood et al brief (the method of the Thomson report amounts to the same thing in the case of Kyuquot). As already noted in great detail in both the presentations of BCFP and the Ministry of Forests and in the review of this report, there is no real reason to expect this method to work. Indeed, it seems clear that it is impossible to determine 'what was harvested'; the necessary data are simply not available.

Can anything be done? With the possible exception of BCFP which seems to refuse to acknowledge there may have been a problem at Shoal Island, all parties seem to agree that the problem was in the scaling procedure and not the scaling itself. The procedure was such that the scalers appear to have occasionally missed logs for which they had responsibility. Since the scaling procedure at Shoal Island did not change from the time of start-up to October 26, 1981, it seems reasonable to conclude that the problem existed for this entire period. The difficulty lies in determining the magnitude of the problem: What fraction of the logs were being missed? Of course, one might anticipate some variability in the fraction being missed due to factors such as the scaler, the sort of log, the weather, and so on. The question really is whether or not such variation is negligible or must be taken into account.

Unfortunately, very little data is available to answer these questions. An overall summary of the results of each of three check scales has already been provided by Whittaker (Appendix B of Ministry of Forest brief). If available in a detailed enough form, the data from each of these check scales could provide some limited information on the

variability of results. On the other hand, as already pointed out by the contractors, the results of even the first of these check scales might be expected to understate the magnitude of the problem. Some additional information might be available from the results of Shadforth's scales of May, June and July 1981 as well as from the Whittaker-Burdge "120 working day" comparison. If possible, the data for the periods immediately prior and subsequent to the change in scaling procedures on October 26, 1981 should be carefully verified and examined in detail.

Nevertheless, the evidence presented seems to suggest that the results of the check scale of September 1-4, 1981 will provide the most reliable assessment of the magnitude of the problem. It is worth noting that while use of the results of this check scale to infer the magnitude of the problem for the entire period does require a consistency assumption concerning the scaling procedure, this differs somewhat from the consistency assumption required as part of the method of volume imputation suggested by the contractors. The assumption here concerns a measurement process which might be expected to be stable over time, while the assumption there concerns yearly truck load averages which might be expected to depend on many factors as already noted in considerable detail. In conclusion, the choice seems to be between using an assessment based on the results of the check scale of September 1-4, 1981 which may well understate the magnitude of the problem but appears to be the only reasonably reliable assessment, or making no assessment at all.

OUR LOAD NO.

#3

LOAD #	pcs.	VOLUME m^3
1	75	56.0
2	37	62.2
3	114	82.6
4	124	83.8
5	69	89.9
6	64	104.5
7	59	84.9
8	68	56.1
9	74	49.6
10	52	50.5
11	55	83.1
12	76	91.1
13	66	54.8
14	52	51.5
15	78	53.9
16	58	48.0
17	111	78.4
18	68	90.8
19	58	51.6
20	74	52.0
21	50	77.1
22	72	84.7
23	60	76.7
24	107	88.5
25	62	89.4
26	65	55.8
27	65	92.1
28	60	87.9

L	pcs	m^3
29	63	100.6
30	51	70.6
31	75	56.4
32	39	62.3
33	68	87.4
34	39	40.6
35	42	37.6
36	101	85.7
37	51	95.1
38	48	90.8
39	61	87.6
40	60	73.1
41	49	89.2
42	59	75.2
* 43	8	5.3
44	47	88.2
45	52	69.9
46	76	80.9
	2962 pcs	3324.0 m^3

CEL GROUP

Appendix B

1962 Scaling of 316 'L' loads

Scale	No. of loads	Total Volume (C.M.)	Average Volume (C.M.)
KI 3	36	2,946.7	81.85
KI 5	38	3,550.8	93.44
KI 8	44	4,070.3	92.51
KI 10	40	3,866.3	96.66
KI 11	30	2,516.9	83.90
KI 12	42	3,713.3	88.41
KI 13	43	3,780.3	87.91
KI 14	43	3,747.3	87.15
Total	316	28,191.9	89.21

Notes:
1. These loads all came from Knight Inlet.
2. 'L' loads are carried in a "Large" truck with cross-section (to top of loading stakes) of 113.5 square feet.
3. Boom-sticks loads are included.
4. Average volume per square foot of cross-section = 0.786 C.M.

SHOAL ISLAND DLS INCOMING BOOM: KI-0003 KNIGHT INLET

---INCOMING--- SEQ BUNDLE MARK	PIECES	SPECIE GRADE	CUBIC METRES	--OUTGOING-- SORT	BOOM
034-0044 0001 17/10	1	BAJ	1.2	•	SH-0282
	1	CEJ	.3	M	SH-0268
	3	CEJ	.8	V	SH-0214
	2	CEX	.4	V	SH-0214
	1	FIH	2.8	+	SH-0267
	1	FIJ	.6	0	SI-0154
	4	FIX	2.7	LR	SH-0274
	1	FIY	.3	LR	SH-0274
	1	HEI	1.4	//	SH-0277
	7	HEI	13.6	I	SH-0279
	31	HEJ	20.9	•	SH-0282
	2	HEJ	4.1	I	SH-0279
	5	HEJ	1.4	X	SH-0272
	5	HEX	1.1	•	SH-0282
	9	HEX	4.1	X	SH-0272
	1	HEY	.3	X	SH-0272
	75 *		56.0 *		
034-0045 0002 17/7	1	BAC	2.9	I	SH-0279
	1	BAH	2.5	I	SH-0279
	1	BAI	1.1	I	SH-0279
	6	BAJ	5.1	•	SH-0282
	2	BAJ	1.1	X	SH-0272
	3	BAX	1.9	•	SH-0282
	1	BAY	1.3	//	SH-0277
	3	BAX	.9	X	SH-0272
	2	HEH	8.0	I	SH-0279
	3	HEI	8.0	I	SH-0279
	1	HEJ	.6	•	SH-0282
	1	HEJ	1.8	I	SH-0279
	1	HEY	.6	•	SH-0282
	6	HEX	18.0	//	SH-0277
	1	HEX	3.1	I	SH-0279
	1	HEX	.7	X	SH-0272
	2	HEY	2.5	//	SH-0277
	1	SPX	2.1	//	SH-0277
	37 *		62.2 *		
034-0046 0003 17/10	4	CEJ	4.4	A	SH-0275
	10	CEJ	5.7	M	SH-0268
	4	CEJ	1.3	V	SH-0214
	1	CEM	1.9	S	SH-0281
	1	CEX	.2	M	SH-0268
	3	CEX	1.2	V	SH-0214
	3	CEY	.8	V	SH-0214
	1	FIH	1.4	+	SH-0267
	1	FIH	1.6	F	SH-0273
	1	FII	.8	LR	SH-0274
	1	FIJ	1.3	F	SH-0273
	3	FIJ	1.8	0	SI-0154
	1	HEH	2.7	I	SH-0279
	2	HEI	1.1	//	SH-0277

SHOAL ISLAND DLS INCOMING BOOM: KI-0003 KNIGHT INLET

----INCOMING---- SN-SEQ BUNDLE MARK	PIECES	SPECIE GRADE	CUBIC METRES	--OUTGOING-- SORT	BOOM
	4	HEI	8.6	I	SH-0279
	44	HEJ	33.4	.	SH-0282
	1	HEJ	1.1	I	SH-0279
	5	HEJ	3.5	X	SH-0272
	5	HEX	2.4	.	SH-0282
	4	HEX	3.0	//	SH-0277
	9	HEX	6.8	X	SH-0272
	1	HEY	.3	.	SH-0282
	1	HEY	.4	//	SH-0277
	4	HEY	1.1	X	SH-0272
	114 *		82.6 *		
034-0047 0004 17/7	1	BAI	1.7	I	SH-0279
	1	CEI	2.3	A	SH-0275
	4	CEJ	5.3	A	SH-0275
	4	CEJ	1.6	M	SH-0268
	2	CEM	1.6	S	SH-0281
	2	CEX	.3	M	SH-0268
	5	CEX	.8	V	SH-0214
	1	CEY	.2	V	SH-0214
	1	FIC	2.0	+	SH-0267
	1	FIH	1.3	F	SH-0273
	1	FIH	.4	0	SI-0154
	1	FII	.8	+	SH-0267
	1	FII	4.4	F	SH-0273
	1	FII	2.7	LR	SH-0274
	1	FIJ	1.4	LR	SH-0274
	1	FIJ	.5	0	SI-0154
	8	FIX	9.2	LR	SH-0274
	2	FIX	.6	0	SI-0154
	1	FIY	2.0	F	SH-0273
	1	FIY	2.9	LR	SH-0274
	1	HEI	.7	.	SH-0282
	1	HEI	.6	//	SH-0277
	3	HEI	6.0	I	SH-0279
	31	HEJ	15.0	.	SH-0282
	15	HEJ	3.0	X	SH-0272
	4	HEX	2.2	.	SH-0282
	2	HEX	1.3	//	SH-0277
	1	HEX	1.0	I	SH-0279
	14	HEX	4.7	X	SH-0272
	1	HEY	.3	X	SH-0272
	1	SPI	2.2	SP	SH-0244
	1	SPJ	1.1	.	SH-0282
	1	SPJ	.8	SP	SH-0244
	5	SPJ	2.3	X	SH-0272
	2	SPX	.6	X	SH-0272
	124 *		83.8 *		
034-0048 0005 17/7	2	BAH	7.7	I	SH-0279
	1	BAI	.7	.	SH-0282
	4	BAI	7.1	//	SH-0277

DATE: 82/05/30 B.C. FOREST SERVICE SCALE 44
---SUMMARY BY BUNDLE---

SHOAL ISLAND ULS INCOMING ROOM: KI-0003 KNIGHT INLET

----INCOMING------- JN-SEQ BUNDLE MARK	PIECES	SPECIE GRADE	CUBIC METRES	--OUTGOING-- SORT	BOOM
	6	BAI	9.2	I	SH-0279
	15	BAJ	13.9	.	SH-0282
	1	BAJ	2.0	I	SH-0279
	6	BAX	3.1	.	SH-0282
	1	BAX	.9	//	SH-0277
	1	BAX	1.6	I	SH-0279
	7	BAX	3.0	X	SH-0272
	2	BAY	4.2	//	SH-0277
	1	BAY	.2	X	SH-0272
	1	HEI	3.3	//	SH-0277
	2	HEI	4.0	I	SH-0279
	4	HEJ	1.9	.	SH-0282
	1	HEJ	.6	X	SH-0272
	1	HEX	.4	.	SH-0282
	9	HEX	22.9	//	SH-0277
	4	HEX	2.7	X	SH-0272
	69 *		89.9 *		
034-0049 0006 17/7	9	BAH	11.2	I	SH-0279
	1	BAI	.7	.	SH-0282
	3	BAI	5.4	I	SH-0279
	14	BAJ	9.7	.	SH-0282
	3	BAJ	5.9	I	SH-0279
	1	BAJ	.3	X	SH-0272
	1	BAX	.3	.	SH-0282
	2	BAX	7.7	//	SH-0277
	1	BAY	1.1	X	SH-0272
	1	CEM	5.7	L	SH-0260
	1	CEI	1.3	A	SH-0275
	1	CEI	4.5	S	SH-0281
	1	CEJ	.4	A	SH-0275
	1	CEX	0.1	S	SH-0281
	1	FIC	5.7	+	SH-0267
	3	FIM	11.5	F	SH-0273
	1	FII	2.8	F	SH-0273
	2	HEI	4.7	I	SH-0279
	18	HEJ	11.3	.	SH-0282
	1	HEJ	.7	I	SH-0279
	1	HEX	1.3	.	SH-0282
	1	HEX	.4	X	SH-0272
	1	HEY	3.4	I	SH-0279
	1	SPJ	1.4	X	SH-0272
	64 *		104.5 *		
034-0050 0007 17/7	4	BAC	7.1	I	SH-0279
	3	BAD	6.4	I	SH-0279
	1	BAI	1.3	//	SH-0277
	5	BAI	10.3	I	SH-0279
	14	BAJ	9.2	.	SH-0282
	3	BAX	.8	.	SH-0282
	6	BAX	5.6	//	SH-0277
	3	BAX	.9	X	SH-0272

DATE: 92/05/30 B.C. FOREST SERVICE SCALE 45
---SUMMARY BY BUNDLE---

SHOAL ISLAND DLS INCOMING BOOM: KI-0003 KNIGHT INLET

--INCOMING-- RU SEQ BUNDLE MARK	PIECES	SPECIE GRADE	CUBIC METRES	--OUTGOING-- SORT	BOOM
	2	HEH	9.4	I	SH-0279
	2	HEI	6.3	//	SH-0277
	1	HEI	6.4	I	SH-0279
	3	HEJ	1.1	.	SH-0282
	1	HEJ	.8	//	SH-0277
	1	HEX	.1	.	SH-0282
	7	HEX	13.4	//	SH-0277
	1	HEX	.0	X	SH-0272
	2	HEY	3.5	//	SH-0277
	59 *		84.9 *		
034-0051 0008 17/10	1	BAC	3.1	I	SH-0279
	2	CEJ	3.1	A	SH-0275
	3	CEJ	2.9	M	SH-0268
	1	CEX	.4	M	SH-0268
	1	CEX	.3	V	SH-0214
	1	FIH	3.1	+	SH-0267
	1	FIH	1.3	0	SI-0154
	1	FII	2.7	F	SH-0273
	1	FII	1.0	LR	SH-0274
	2	FIJ	.5	LR	SH-0274
	2	FIJ	.8	0	SI-0154
	2	FIX	.8	LR	SH-0274
	1	HEH	2.4	I	SH-0279
	1	HEI	.7	.	SH-0282
	2	HEI	4.7	I	SH-0279
	18	HEJ	12.3	.	SH-0282
	1	HEJ	.0	//	SH-0277
	4	HEJ	5.5	I	SH-0279
	6	HEJ	1.0	X	SH-0272
	3	HEX	.6	.	SH-0282
	5	HEX	4.2	//	SH-0277
	6	HEX	2.1	X	SH-0272
	1	HEY	1.1	//	SH-0277
	2	HEY	.3	X	SH-0272
	68 *		86.1 *		
034-0052 0009 17/10	1	BAJ	.7	.	SH-0282
	1	BAJ	.3	X	SH-0272
	2	CEJ	1.9	A	SH-0275
	12	CEJ	5.6	M	SH-0268
	8	CEJ	3.4	V	SH-0214
	1	CEM	.4	V	SH-0214
	1	CEX	.7	A	SH-0275
	1	FIH	2.9	+	SH-0267
	2	FIH	5.3	F	SH-0273
	2	FIH	4.3	0	SI-0154
	1	FII	2.4	F	SH-0273
	1	FIJ	.2	LR	SH-0274
	4	FIJ	2.4	0	SI-0154
	4	FIX	1.5	LR	SH-0274
	1	FIX	.2	0	SI-0154

DATE: 92/06/30 P.C. FOREST SERVICE SCALE 46
---SUMMARY BY BUNDLE---

SHOAL ISLAND DLS INCOMING BOOM: KI-0003 KNIGHT INLET

---INCOMING--- SEQ BUNDLE MARK	PIECES	SPECIE GRADE	CUBIC METRES	--OUTGOING-- SORT	BOOM
	3	HEI	4.5	I	SH-0279
	11	HEJ	6.6	.	SH-0282
	1	HEJ	.6	X	SH-0272
	3	HEX	.5	.	SH-0282
	8	HEX	1.6	X	SH-0272
	1	HEY	.5	//	SH-0277
	2	HEY	.8	X	SH-0272
	1	SPX	.2	X	SH-0272
	1	WHH	1.9	LR	SH-0274
	74	*	49.5	*	
034-0053 0010 17/7	1	BAJ	.6	.	SH-0282
	1	CEI	4.9	L	SH-0280
	1	CEJ	.3	W	SH-0268
	3	CEJ	.6	V	SH-0214
	3	CEX	2.0	V	SH-0269
	7	CEX	2.7	V	SH-0214
	1	FIC	2.6	+	SH-0267
	1	FIH	5.1	+	SH-0267
	1	FIH	5.6	F	SH-0273
	1	FII	3.3	+	SH-0267
	2	FIX	.9	LR	SH-0274
	2	FIY	1.8	LR	SH-0274
	2	HEH	3.7	I	SH-0279
	1	HEI	2.6	//	SH-0277
	1	HEI	1.1	I	SH-0279
	8	HEJ	5.1	.	SH-0282
	3	HEJ	1.1	X	SH-0272
	1	HEX	1.1	//	SH-0277
	1	HEX	1.5	I	SH-0279
	8	HEY	2.1	X	SH-0272
	3	SPX	1.6	X	SH-0272
	52	*	50.5	*	
034-0054 0011 17/7	1	BAC	1.8	I	SH-0279
	1	BAD	3.9	I	SH-0279
	3	BAH	6.3	I	SH-0279
	5	BAI	8.5	I	SH-0279
	12	BAJ	8.1	.	SH-0282
	1	BAJ	1.1	I	SH-0279
	3	BAJ	1.7	X	SH-0272
	2	BAX	.9	.	SH-0282
	3	BAX	4.3	//	SH-0277
	2	BAX	.7	X	SH-0272
	2	BAY	1.5	//	SH-0277
	1	CEH	5.4	L	SH-0280
	1	CEI	4.0	A	SH-0275
	1	CEJ	.3	W	SH-0268
	1	CEX	.9	A	SH-0275
	1	HEH	3.5	I	SH-0279
	1	HEI	3.9	//	SH-0277
	2	HEI	3.0	I	SH-0279

DATE: 82/05/30

B.C. FOREST SERVICE SCALE
---SUMMARY BY BUNDLE---

47 47417

SHOAL ISLAND DLS INCOMING BOOM: KI-0003 KNIGHT INLET

---INCOMING--- RL -SEQ BUNDLE MARK	PIECES	SPECIE GRADE	CUBIC METRES	--OUTGOING-- SORT	BOOM
	3	HEJ	1.9	•	SH-0282
	1	HEJ	2.4	I	SH-0279
	1	HEX	1.3	•	SH-0282
	3	HEX	3.9	//	SH-0277
	1	HEX	.6	X	SH-0272
	1	HEY	1.1	//	SH-0277
	2	SPI	10.1	SP	SI-0244
	55 *		83.1 *		
034-0055 0012 17/7	1	BAC	1.6	I	SH-0279
	1	BAH	1.6	I	SH-0279
	1	BAI	1.0	//	SH-0277
	4	BAI	8.3	I	SH-0279
	7	BAJ	4.6	•	SH-0282
	1	BAX	1.0	//	SH-0277
	3	BAX	1.8	X	SH-0272
	1	CEH	2.2	A	SH-0275
	1	CEH	5.1	L	SH-0250
	1	CEI	2.6	A	SH-0275
	1	CEI	1.8	S	SH-0281
	5	CEJ	3.4	V	SH-0268
	1	CEX	.5	S	SH-0281
	1	CEX	.2	V	SH-0214
	1	FIH	7.6	F	SH-0273
	1	FIH	1.7	O	SI-0154
	1	FIX	1.8	F	SH-0273
	2	FIX	2.6	LR	SH-0274
	1	HEI	1.6	•	SH-0282
	2	HEI	1.6	//	SH-0277
	8	HEI	15.4	I	SH-0279
	23	HEJ	17.4	•	SH-0282
	1	HEJ	1.9	I	SH-0279
	3	HEJ	1.0	X	SH-0272
	1	HEX	.6	•	SH-0282
	1	HEX	1.0	//	SH-0277
	2	HEX	1.1	X	SH-0272
	76 *		91.1 *		
034-0056 0013 17/10	1	BAX	.4	•	SH-0282
	5	CEJ	2.3	M	SH-0268
	1	CEJ	.3	V	SH-0214
	2	CEM	1.8	S	SH-0281
	1	CEM	.4	V	SH-0214
	3	CEX	.9	V	SH-0214
	1	FIH	2.5	+	SH-0267
	3	FIH	6.6	F	SH-0273
	2	FIH	1.4	LR	SH-0274
	4	FIJ	3.4	O	SI-0154
	1	FIX	.4	LR	SH-0274
	1	HEI	1.6	//	SH-0277
	8	HEI	16.2	I	SH-0279
	10	HEJ	7.7	•	SH-0282

DATE: 82/06/30 B.C. FOREST SERVICE SCALE 46
---SUMMARY BY BUNDLE---

SHOAL ISLAND DLS INCOMING BOOM: KI-0003 KNIGHT INLET

---INCOMING--- RECEIVED BUNDLE MARK	PIECES	SPECIE GRADE	CUBIC METRES	--OUTGOING-- SORT	BOOM
	3	HEJ	2.3	X	SH-0272
	5	HEX	1.0	.	SH-0282
	4	HEX	2.3	X	SH-0272
	2	HEY	1.6	//	SH-0277
	5	HEY	1.5	X	SH-0272
	67 *		54.6 *		
034-0057 0014 17/7	1	BAC	1.7	I	SH-0279
	2	BAH	6.6	I	SH-0279
	1	BAI	.6	.	SH-0282
	1	BAI	2.2	//	SH-0277
	2	BAI	3.3	I	SH-0279
	1	BAI	.6	X	SH-0272
	14	BAJ	8.0	.	SH-0282
	1	BAJ	1.5	I	SH-0279
	1	BAJ	.5	X	SH-0272
	2	BAX	1.0	.	SH-0282
	1	BAX	1.1	//	SH-0277
	1	BAX	.2	X	SH-0272
	1	BAY	1.3	//	SH-0277
	1	BAY	.1	X	SH-0272
	1	HED	4.1	I	SH-0279
	1	HEH	3.3	I	SH-0279
	1	HEI	3.6	//	SH-0277
	1	HEI	1.9	I	SH-0279
	9	HEJ	3.4	.	SH-0282
	2	HEJ	.5	X	SH-0272
	2	HEX	2.1	//	SH-0277
	3	HEY	1.1	X	SH-0272
	1	HEY	.8	//	SH-0277
	1	SPF	2.0	SP	SH-0244
	52 *		51.5 *		
034-0056 0015 17/10	1	CEI	1.2	S	SH-0261
	1	CEJ	.6	A	SH-0275
	9	CEJ	3.1	M	SH-0269
	3	CEJ	1.0	V	SH-0214
	1	CEJ	.3	X	SH-0272
	1	CEX	.5	A	SH-0275
	2	CEX	.9	V	SH-0214
	1	CEY	.4	V	SH-0214
	1	FIC	2.2	+	SH-0267
	1	FIH	1.9	LR	SH-0274
	2	FIJ	.7	O	SI-0154
	1	FIX	.5	LR	SH-0274
	7	HEI	5.5	//	SH-0277
	6	HEI	10.8	I	SH-0279
	19	HEJ	11.6	.	SH-0282
	4	HEJ	4.4	I	SH-0279
	1	HEJ	.4	M	SH-0269
	10	HEJ	4.4	X	SH-0272
	2	HEX	.4	.	SH-0282

SHOAL ISLAND DLS INCOMING BOOM: KI-0003 KNIGHT INLET

---INCOMING--- SEQ BUNDLE MARK	PIECES	SPECIE GRADE	CUBIC METRES	--OUTGOING-- SORT	BOOM
	3	HEY	2.2	//	SH-0277
	1	HEX	.9	I	SH-0279
	4	HEX	1.4	X	SH-0272
	3	HEY	.6	X	SH-0272
	78 *		53.9 *		
034-0059 0016 17/10	4	CEJ	2.1	M	SH-0268
	1	CEJ	.2	V	SH-0214
	1	CEM	.4	V	SH-0214
	1	CEX	.3	V	SH-0214
	1	CEY	.2	V	SH-0214
	3	FIC	6.0	+	SH-0267
	2	FIH	3.2	F	SH-0273
	1	FIJ	.2	LR	SH-0274
	2	FIJ	1.7	O	SI-0154
	1	FIX	.5	LR	SH-0274
	2	HEI	4.0	I	SH-0279
	16	HEJ	15.2	.	SH-0282
	2	HEJ	3.3	I	SH-0279
	7	HEJ	3.0	X	SH-0272
	1	HEJ	1.3	O	SI-0154
	2	HEX	1.7	//	SH-0277
	9	HEX	2.5	X	SH-0272
	1	HEY	1.1	X	SH-0272
	1	SPX	1.1	X	SH-0272
	58 *		48.0 *		
034-0060 0017 17/10	4	CEJ	3.8	A	SH-0275
	13	CEJ	7.5	M	SH-0268
	5	CEJ	1.1	V	SH-0214
	3	CEX	.5	M	SH-0268
	1	CEY	.8	S	SH-0281
	6	CEY	2.4	V	SH-0214
	1	CEY	.3	V	SH-0214
	1	FIC	3.0	+	SH-0267
	1	FIH	1.1	O	SI-0154
	2	FII	5.1	F	SH-0273
	1	FIJ	1.7	F	SH-0273
	2	FIJ	.8	LR	SH-0274
	2	FIJ	.7	O	SI-0154
	3	FIX	1.5	LR	SH-0274
	1	FIX	.1	X	SH-0272
	2	FIX	1.3	O	SI-0154
	1	HEH	2.3	I	SH-0279
	1	HEI	.6	.	SH-0282
	2	HEI	1.9	//	SH-0277
	8	HEI	14.5	I	SH-0279
	3	HEI	1.9	X	SH-0272
	17	HEJ	9.0	.	SH-0282
	1	HEJ	1.2	I	SH-0279
	6	HEJ	1.7	X	SH-0272
	5	HEX	1.9	.	SH-0282

SHOAL ISLAND DLS INCOMING BOOM: KI-0003 KNIGHT INLET

----INCOMING------- N-SEC BUNDLE MARK	PIECES	SPECIE GRADE	CUBIC METRES	--OUTGOING-- SORT	BOOM
	1	HEX	1.1	//	SH-0277
	10	HEX	3.6	X	SH-0272
	3	HEY	.8	X	SH-0272
	1	SPI	3.8	//	SH-0277
	1	SPJ	.5	X	SH-0272
	1	SPX	1.9	SP	SH-0244
	111 *		78.4 *		
034-0061 0018 17/7	1	BAD	4.1	I	SH-0279
	1	BAH	4.4	I	SH-0279
	5	BAI	7.9	I	SH-0279
	12	BAJ	11.0	.	SH-0282
	1	BAX	.2	.	SH-0282
	2	BAX	3.5	//	SH-0277
	4	BAX	1.4	X	SH-0272
	2	BAY	1.4	//	SH-0277
	1	CEJ	1.0	A	SH-0275
	1	CEY	.8	S	SH-0281
	1	CEX	1.7	A	SH-0275
	1	CEX	.3	V	SH-0214
	1	FIC	6.8	+	SH-0267
	1	FIH	7.0	F	SH-0273
	3	FII	7.3	F	SH-0273
	3	FIX	3.3	LR	SH-0274
	1	HEI	4.8	//	SH-0277
	3	HEI	6.3	I	SH-0279
	12	HEJ	7.8	.	SH-0282
	1	HEJ	.2	X	SH-0272
	4	HEX	6.2	//	SH-0277
	7	HEX	3.4	X	SH-0272
	68 *		90.3 *		
034-0062 0019 17/7	1	CEJ	2.2	A	SH-0275
	3	CEJ	.8	A	SH-0268
	2	CEJ	.9	V	SH-0214
	1	FIB	4.3	+	SH-0267
	1	FIH	5.0	F	SH-0273
	4	FII	9.0	F	SH-0273
	1	FII	3.9	LR	SH-0274
	1	FIJ	.7	LR	SH-0274
	3	FIJ	1.9	D	SI-0154
	1	HEI	2.0	I	SH-0279
	5	HEJ	5.7	.	SH-0282
	1	HEJ	1.2	//	SH-0277
	3	HEJ	.7	X	SH-0272
	2	HEX	.6	.	SH-0282
	3	HEX	2.8	//	SH-0277
	1	HEX	.8	I	SH-0279
	11	HEX	3.7	X	SH-0272
	1	HEY	.4	X	SH-0272
	1	SPH	1.5	SP	SH-0244
	1	SPJ	1.0	SP	SH-0244

SHOAL ISLAND DLS INCOMING BOOM: KI-0003 KNIGHT INLET

----INCOMING------- SEQ BUNDLE MARK	PIECES	SPECIE GRADE	CUBIC METRES	--OUTGOING-- SORT	BOOM
	5	SPJ	1.5	X	SH-0272
	2	SPX	1.0	X	SH-0272
	58 *		51.6 *		
034-0063 0020 17/10	2	BAH	3.2	I	SH-0279
	1	BAJ	1.3	•	SH-0282
	2	CEJ	1.3	M	SH-0268
	1	CEJ	.9	S	SH-0281
	2	CEJ	.4	V	SH-0214
	1	CEY	.4	A	SH-0275
	1	CEY	.4	V	SH-0214
	2	FIH	4.7	+	SH-0267
	1	FIH	1.5	O	SI-0154
	1	FIJ	1.1	LR	SH-0274
	1	FIJ	1.5	F	SH-0273
	1	FIJ	.5	LR	SH-0274
	2	FIJ	.8	O	SI-0154
	4	FIX	2.6	LR	SH-0274
	1	HEI	.6	•	SH-0282
	2	HEI	4.3	I	SH-0279
	24	HEJ	13.6	•	SH-0282
	1	HEJ	.9	//	SH-0277
	1	HEJ	1.9	I	SH-0279
	5	HEJ	2.1	X	SH-0272
	7	HEX	3.3	•	SH-0282
	1	HEX	.8	//	SH-0277
	8	HEX	2.9	X	SH-0272
	2	HEY	.1	X	SH-0272
	74 *		52.3 *		
034-0064 0021 17/7	1	BAH	2.5	I	SH-0279
	1	BAI	1.5	//	SH-0277
	1	BAI	1.6	I	SH-0279
	4	BAJ	2.4	•	SH-0282
	1	BAJ	1.2	//	SH-0277
	1	BAJ	.9	X	SH-0272
	1	BAX	.2	X	SH-0272
	1	BAY	1.6	//	SH-0277
	1	CEK	3.8	S	SH-0281
	4	CEL	6.8	S	SH-0261
	2	CEM	4.1	S	SH-0281
	1	CEX	.5	V	SH-0214
	1	FIH	3.0	F	SH-0273
	1	HEI	.6	•	SH-0282
	4	HEI	14.9	//	SH-0277
	5	HEI	5.5	I	SH-0279
	9	HEJ	6.8	•	SH-0282
	2	HEJ	1.4	X	SH-0272
	2	HEX	.8	•	SH-0282
	1	HEX	8.4	//	SH-0277
	3	HEX	1.2	X	SH-0272
	3	HEY	5.4	//	SH-0277
	50 *		77.1 *		

SHOAL ISLAND DLS INCOMING BOOM: KI-0003 KNIGHT INLET

---INCOMING--- SEQ BUNDLE MARK	PIECES	SPECIE GRADE	CUBIC METRES	--OUTGOING-- SORT	BOOM
034-0065 0022 17/7	1	BAH	1.6	I	SH-0279
	7	BAI	9.7	I	SH-0279
	3	BAJ	2.2	.	SH-0282
	3	BAX	.6	.	SH-0282
	3	BAX	2.1	//	SH-0277
	1	BAX	.4	X	SH-0272
	1	BAY	.9	//	SH-0277
	1	CEH	2.1	A	SH-0275
	1	CEI	1.3	S	SH-0281
	1	CEJ	1.4	A	SH-0275
	2	CEJ	.5	A	SH-0269
	1	CEM	.6	S	SH-0281
	1	FIA	8.8	+	SH-0267
	2	FIC	3.6	+	SH-0267
	1	FIH	1.3	+	SH-0267
	1	FIH	7.8	F	SH-0273
	1	FIH	.9	D	SI-0154
	1	FII	2.6	F	SH-0273
	1	FIX	1.0	F	SH-0273
	1	FIX	.9	LR	SH-0274
	1	HEI	.5	.	SH-0282
	1	HEI	1.9	//	SH-0277
	5	HEI	10.7	I	SH-0279
	23	HEJ	17.5	.	SH-0282
	2	HEJ	.7	X	SH-0272
	1	HEX	.3	.	SH-0282
	2	HEX	1.3	//	SH-0277
	3	HEX	1.1	X	SH-0272
	72 *		84.7 *		
034-0066 0023 17/7	3	BAC	6.2	I	SH-0279
	2	BAH	5.6	I	SH-0279
	1	BAI	.9	.	SH-0282
	2	BAI	4.9	//	SH-0277
	6	BAI	11.8	I	SH-0279
	1	BAI	.6	X	SH-0272
	6	BAJ	4.4	.	SH-0282
	1	BAJ	.6	I	SH-0279
	2	BAJ	.8	X	SH-0272
	3	BAX	1.8	.	SH-0282
	2	BAX	4.4	//	SH-0277
	1	BAX	.5	X	SH-0272
	4	BAY	6.4	//	SH-0277
	1	BAY	.8	I	SH-0279
	1	BAY	.2	X	SH-0272
	1	CEM	1.8	S	SH-0281
	1	FII	2.1	LR	SH-0274
	1	FIX	.6	LR	SH-0274
	2	HEH	3.2	I	SH-0279
	2	HEI	4.8	I	SH-0279
	12	HEJ	10.2	.	SH-0282
	1	HEJ	1.7	I	SH-0279

SHOAL ISLAND DLS INCOMING BOOM: KI-0003 KNIGHT INLET

---INCOMING--- SEQ BUNDLE MARK	PIECES	SPECIE GRADE	CUBIC METRES	--OUTGOING-- SORT	BOOM
	2	HEJ	1.1	X	SH-0272
	2	HEX	1.3	.	SH-0282
	60 *		76.7 *		
034-0067 0024 17/7	2	BAJ	1.2	.	SH-0282
	1	CEI	2.0	A	SH-0275
	1	CEI	4.3	S	SH-0281
	3	CEJ	4.7	A	SH-0275
	5	CEJ	3.2	M	SH-0268
	1	CEL	2.3	S	SH-0281
	2	CEX	.8	V	SH-0214
	5	FIH	14.8	F	SH-0273
	3	FII	6.0	F	SH-0273
	1	FII	2.2	LR	SH-0274
	4	FIJ	3.5	0	SI-0154
	3	FIX	2.3	LR	SH-0274
	1	HEI	.9	//	SH-0277
	2	HEI	2.6	I	SH-0279
	30	HEJ	17.4	.	SH-0282
	13	HEJ	5.3	X	SH-0272
	4	HEX	2.1	.	SH-0282
	2	HEX	1.8	//	SH-0277
	1	HEX	.1	LR	SH-0274
	16	HEX	5.2	X	SH-0272
	2	SPJ	.9	.	SH-0282
	1	SPJ	1.2	SP	SH-0244
	2	SPJ	1.1	X	SH-0272
	2	SPX	.6	X	SH-0272
	107 *		88.5 *		
034-0068 0025 17/7	2	BAH	7.3	I	SH-0279
	1	BAI	1.0	//	SH-0277
	9	BAI	22.6	I	SH-0279
	10	BAJ	7.5	.	SH-0282
	2	BAJ	1.6	I	SH-0279
	4	BAX	.9	.	SH-0282
	3	BAX	8.3	//	SH-0277
	3	BAX	4.0	I	SH-0279
	1	BAX	.2	X	SH-0272
	1	CEJ	1.3	A	SH-0275
	2	HEH	10.5	I	SH-0279
	1	HEI	4.2	//	SH-0277
	1	HEI	5.6	I	SH-0279
	3	HEJ	.7	.	SH-0282
	2	HEJ	.5	X	SH-0272
	1	HEX	.3	.	SH-0282
	2	HEX	4.3	//	SH-0277
	1	HEX	1.6	I	SH-0279
	6	HEX	1.5	X	SH-0272
	3	HEY	1.3	//	SH-0277
	1	SPI	2.7	SP	SH-0244
	1	SPJ	.2	X	SH-0272

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SHOAL ISLAND DLS INCOMING BOOM: KI-0003 KNIGHT INLET

---INCOMING--- -SEQ BUNDLE MARK	PIECES	SPECIE GRADE	CUBIC METRES	--OUTGOING-- SORT	BOOM
	1	SPX	.9	//	SH-0277
	1	SPX	.4	X	SH-0272
	62 *		99.4 *		
034-0069 0026 17/10	2	CEJ	.8	V	SH-0214
	2	CEX	.7	V	SH-0214
	2	FIC	4.6	+	SH-0267
	3	FIH	5.6	+	SH-0267
	2	FIH	3.6	F	SH-0273
	1	FII	1.0	O	SI-0154
	1	FIJ	1.5	LR	SH-0274
	2	FIX	.6	LR	SH-0274
	1	FIX	.2	O	SI-0154
	1	FIY	.5	LR	SH-0274
	6	HEI	11.2	I	SH-0279
	16	HEJ	12.5	.	SH-0282
	1	HEJ	.9	//	SH-0277
	1	HEJ	1.3	I	SH-0279
	2	HEJ	1.5	X	SH-0272
	2	HEX	.4	.	SH-0282
	2	HEX	1.8	//	SH-0277
	13	HEX	4.4	X	SH-0272
	3	HEY	1.7	//	SH-0277
	2	HEY	.6	X	SH-0272
	85 *		55.8 *		
034-0070 0027 17/7	1	BAC	3.6	I	SH-0279
	1	BAH	1.1	.	SH-0282
	1	BAH	2.5	I	SH-0279
	1	BAI	.6	.	SH-0282
	1	BAI	1.0	//	SH-0277
	5	BAI	8.5	I	SH-0279
	1	BAI	.6	X	SH-0272
	11	BAJ	9.5	.	SH-0282
	3	BAJ	6.5	I	SH-0279
	1	BAX	2.0	//	SH-0277
	1	BAX	.4	X	SH-0272
	1	CEJ	1.5	A	SH-0275
	2	CEJ	.7	M	SH-0268
	1	CEJ	.3	V	SH-0214
	1	CEM	1.1	S	SH-0281
	1	FIB	4.5	+	SH-0267
	1	FIC	5.9	+	SH-0267
	2	FIH	6.4	+	SH-0267
	4	FII	6.6	F	SH-0273
	1	FII	4.9	LR	SH-0274
	2	FIX	1.6	LR	SH-0274
	3	HEI	8.2	I	SH-0279
	12	HEJ	9.1	.	SH-0282
	1	HEJ	2.0	I	SH-0279
	5	HEJ	2.2	X	SH-0272
	1	HEX	.3	.	SH-0282
	85 *		92.1 *		

SHOAL ISLAND DLS INCOMING BOOM: KI-0003 KNIGHT INLET

----INCOMING------- #-SEQ BUNDLE MARK	PIECES	SPECIE GRADE	CUBIC METRES	--OUTGOING-- SORT	BOOM
034-0071 0028 17/7	2	BAH	9.2	I	SH-0279
	1	BAI	.7	.	SH-0282
	1	BAI	5.2	//	SH-0277
	6	BAI	18.0	I	SH-0279
	4	BAJ	4.1	.	SH-0282
	1	BAJ	.7	I	SH-0279
	2	BAX	.7	.	SH-0282
	2	BAX	2.2	//	SH-0277
	2	BAY	3.0	//	SH-0277
	1	CEJ	.5	M	SH-0268
	1	FII	2.3	F	SH-0273
	1	FIX	2.3	LR	SH-0274
	2	HEH	9.0	I	SH-0279
	3	HEI	5.1	I	SH-0279
	22	HEJ	17.9	.	SH-0282
	1	HEJ	1.9	I	SH-0279
	2	HEX	2.2	.	SH-0282
	3	HEX	1.3	X	SH-0272
	1	SPJ	.3	SP	SH-0244
	2	SPJ	.8	X	SH-0272
	80 *		87.9 *		
034-0072 0029 17/7	2	BAI	3.7	//	SH-0277
	5	BAI	10.5	I	SH-0279
	6	BAJ	6.0	.	SH-0282
	1	BAJ	1.0	//	SH-0277
	2	BAJ	2.2	I	SH-0279
	1	BAJ	.5	X	SH-0272
	1	BAX	.6	.	SH-0282
	2	BAX	2.6	//	SH-0277
	1	CEH	3.3	A	SH-0275
	1	CEJ	1.7	A	SH-0275
	1	CEJ	.5	M	SH-0268
	1	CEL	5.0	S	SH-0261
	1	CEY	.2	V	SH-0214
	1	FIH	5.4	+	SH-0267
	3	FIH	21.1	F	SH-0273
	1	FIX	4.4	F	SH-0273
	1	HEI	.6	//	SH-0277
	4	HEI	6.1	I	SH-0279
	18	HEJ	15.6	.	SH-0282
	3	HEJ	4.6	I	SH-0279
	3	HEJ	1.1	X	SH-0272
	3	HEX	1.2	.	SH-0282
	1	HEX	.7	//	SH-0277
	83 *		100.6 *		
034-0073 0030 17/7	1	BAC	1.6	I	SH-0279
	4	BAI	16.0	I	SH-0279
	10	BAJ	7.8	.	SH-0282
	2	BAJ	2.6	I	SH-0279
	4	BAJ	1.4	X	SH-0272

SHOAL ISLAND DLS INCOMING BOOM: KI-0003 KNIGHT INLET

RE	---INCOMING--- SEQ BUNDLE MARK	PIECES	SPECIE GRADE	CUBIC METRES	--OUTGOING-- SORT	BOOM
		2	BAX	.5	.	SH-0282
		3	BAX	5.1	//	SH-0277
		1	BAX	3.5	I	SH-0279
		7	BAX	1.6	X	SH-0272
		3	BAY	2.3	//	SH-0277
		1	HEH	4.5	I	SH-0279
		2	HEI	5.6	//	SH-0277
		2	HEI	3.7	I	SH-0279
		1	HEJ	.2	.	SH-0282
		1	HEJ	.8	//	SH-0277
		2	HEX	2.8	//	SH-0277
		5	HEY	10.2	//	SH-0277
		51 *		70.6 *		
	034-0074 0031 17/10	1	BAJ	.3	X	SH-0272
		2	CEJ	1.4	A	SH-0275
		1	CEJ	.3	M	SH-0268
		2	CEJ	.3	V	SH-0214
		1	CEM	.7	S	SH-0251
		1	CEM	.5	V	SH-0214
		1	CEX	.1	M	SH-0268
		2	CEX	.4	V	SH-0214
		3	FIH	10.7	+	SH-0267
		1	FII	2.1	F	SH-0273
		1	FII	1.1	LR	SH-0274
		3	FIJ	1.6	O	SI-0154
		4	FIX	3.9	LR	SH-0274
		1	FIX	.2	O	SI-0154
		1	HEI	.5	.	SH-0282
		4	HEI	6.3	I	SH-0279
		14	HEJ	11.9	.	SH-0282
		1	HEJ	1.6	I	SH-0279
		7	HEJ	2.7	X	SH-0272
		3	HEX	3.1	.	SH-0282
		17	HEX	5.6	X	SH-0272
		1	HEY	.6	//	SH-0277
		1	HEY	.2	X	SH-0272
		75 *		56.4 *		
	034-0075 0032 17/7	3	BAH	10.7	I	SH-0279
		1	BAI	.6	//	SH-0284
		2	BAI	3.5	I	SH-0279
		5	BAJ	5.1	.	SH-0282
		1	BAJ	1.6	I	SH-0279
		1	BAY	2.7	//	SH-0277
		1	BAY	1.7	//	SH-0284
		3	CEJ	1.5	M	SH-0268
		1	CEM	.7	S	SH-0281
		1	CEX	.2	S	SH-0261
		1	FIC	4.6	+	SH-0267
		1	FIH	4.6	+	SH-0267
		1	FII	4.8	F	SH-0273

DATE: 82/06/30

B.C. FOREST SERVICE SCALE
---SUMMARY BY BUNDLE---

SHOAL ISLAND DLS INCOMING BOOM: KI-0003 KNIGHT INLET

----INCOMING------- .-SEQ BUNDLE MARK	PIECES	SPECIE GRADE	CUBIC METRES	--OUTGOING-- SORT	BOOM
	2	FIX	3.9	LR	SH-0274
	1	HEI	3.2	//	SH-0284
	2	HEI	3.8	I	SH-0279
	4	HEJ	2.5	.	SH-0282
	1	HEJ	1.7	I	SH-0279
	3	HEJ	1.0	X	SH-0272
	1	HEX	.3	.	SH-0282
	1	HEX	1.6	//	SH-0284
	1	HEX	1.0	I	SH-0279
	1	HEY	.4	X	SH-0272
	39 *		62.3 *		
034-0076 0033 17/7	3	BAC	8.7	I	SH-0279
	3	BAH	9.0	I	SH-0279
	2	BAI	3.0	//	SH-0284
	1	BAI	2.2	I	SH-0279
	15	BAJ	10.1	.	SH-0282
	3	BAJ	5.4	I	SH-0279
	3	BAX	.7	.	SH-0282
	8	BAX	3.2	X	SH-0272
	1	BAY	.4	//	SH-0284
	1	CEM	1.3	S	SH-0281
	1	FIC	3.6	+	SH-0267
	1	FIH	4.0	+	SH-0267
	2	FII	12.3	F	SH-0273
	4	FII	8.3	LR	SH-0274
	1	FIX	1.5	F	SH-0273
	1	FIX	1.0	LR	SH-0274
	8	HEJ	5.7	.	SH-0282
	5	HEJ	2.4	X	SH-0272
	4	HEX	2.1	X	SH-0272
	1	SPY	1.9	//	SH-0284
	85 *		97.4 *		
034-0077 0034 17/7	1	BAI	.8	.	SH-0282
	2	BAI	2.6	//	SH-0284
	1	BAI	1.2	I	SH-0279
	16	BAJ	11.1	.	SH-0282
	1	BAX	.3	.	SH-0282
	1	BAX	.4	//	SH-0284
	2	BAX	.7	X	SH-0272
	1	HEJ	.4	.	SH-0282
	1	HEX	.2	.	SH-0282
	4	HEX	12.8	//	SH-0284
	3	HEX	1.3	X	SH-0272
	4	HEY	7.0	//	SH-0284
	1	SPJ	.6	X	SH-0272
	1	SPX	.4	X	SH-0272
	39 *		40.6 *		
034-0078 0035 17/7	1	BAC	1.7	I	SH-0279
	1	BAH	2.3	I	SH-0279

SHOAL ISLAND DLS INCOMING BOOM: KI-0003 KNIGHT INLET

----INCOMING------- -SEQ BUNDLE MARK	PIECES	SPECIE GRADE	CUBIC METRES	--OUTGOING-- SORT	BOOM
	1	BAI	.7	.	SH-0282
	1	BAI	1.5	I	SH-0279
	1	BAI	.7	X	SH-0272
	12	BAJ	8.1	.	SH-0282
	2	BAJ	2.5	I	SH-0279
	1	BAJ	.8	X	SH-0272
	5	BAX	1.7	.	SH-0282
	1	BAX	.6	//	SH-0284
	1	BAX	2.0	I	SH-0279
	1	BAX	.4	X	SH-0272
	4	HEJ	2.6	.	SH-0282
	2	HEJ	.7	X	SH-0272
	1	HEX	2.1	//	SH-0284
	5	HEY	2.4	X	SH-0272
	2	HEY	6.6	//	SH-0284
	42 *		37.6 *		
034-0079 0036 17/10	4	CEJ	3.5	M	SH-0268
	1	CEM	.6	V	SH-0214
	1	CEX	.3	M	SH-0268
	1	CEX	.8	S	SH-0261
	2	CEX	.3	V	SH-0214
	3	FIC	7.5	+	SH-0267
	1	FIH	1.6	+	SH-0267
	2	FIH	4.4	F	SH-0273
	2	FIH	2.7	O	SI-0154
	1	FII	1.0	F	SH-0273
	1	FII	.7	LR	SH-0274
	1	FIJ	.2	LR	SH-0274
	2	FIJ	1.3	O	SI-0154
	1	FIX	1.8	F	SH-0273
	3	FIX	1.7	LR	SH-0274
	2	FIX	1.9	O	SI-0154
	3	HEI	4.7	//	SH-0284
	6	HEI	10.0	I	SH-0279
	3	HEI	2.0	X	SH-0283
	29	HEJ	21.3	.	SH-0282
	1	HEJ	.6	I	SH-0279
	3	HEJ	1.5	X	SH-0283
	4	HEX	2.0	.	SH-0282
	5	HEX	4.1	//	SH-0284
	3	HEX	.6	X	SH-0272
	13	HEX	5.3	X	SH-0283
	1	HEY	.2	.	SH-0282
	1	HEY	1.7	//	SH-0284
	1	HEY	.5	X	SH-0283
	101 *		85.7 *		
-0080 0037 17/7	1	BAH	4.3	I	SH-0279
	1	BAI	3.0	//	SH-0284
	3	BAI	7.6	I	SH-0279
	1	BAJ	.6	.	SH-0282

SHOAL ISLAND DLS INCOMING BOOM: KI-0003 KNIGHT INLET

----INCOMING---- N-SEQ BUNDLE MARK	PIECES	SPECIE GRADE	CUBIC METRES	--OUTGOING-- SORT	BOOM
	1	CEI	3.8	S	SH-0281
	1	CEL	2.5	S	SH-0281
	2	CEM	4.1	S	SH-0281
	1	FID	9.6	F	SH-0273
	2	FII	9.0	F	SH-0273
	1	FII	3.4	LR	SH-0274
	1	FIX	1.7	LR	SH-0274
	1	FIY	.9	LR	SH-0274
	1	HEI	1.9	.	SH-0282
	4	HEI	8.9	//	SH-0284
	7	HEI	14.5	I	SH-0279
	19	HEJ	17.0	.	SH-0282
	1	HEJ	1.7	//	SH-0284
	1	HEJ	.8	X	SH-0283
	1	HEX	1.0	.	SH-0282
	2	HEX	.8	X	SH-0283
	51 *		95.1 *		
034-0081 0038 17/7	1	BAC	1.4	.	SH-0282
	3	BAH	20.4	I	SH-0279
	1	BAI	1.0	//	SH-0284
	7	BAI	21.4	I	SH-0279
	11	BAJ	10.0	.	SH-0282
	1	BAJ	2.1	I	SH-0279
	1	BAX	.8	.	SH-0282
	1	BAX	.6	//	SH-0284
	4	BAX	1.9	X	SH-0283
	1	HEH	3.5	//	SH-0284
	1	HEH	1.9	I	SH-0279
	1	HEI	3.6	//	SH-0284
	2	HEI	6.0	I	SH-0279
	1	HEJ	.7	.	SH-0282
	1	HEJ	1.6	I	SH-0279
	5	HEX	7.2	//	SH-0284
	5	HEX	5.5	X	SH-0283
	1	HEY	1.0	//	SH-0284
	48 *		90.6 *		
034-0082 0039 17/7	1	BAH	3.1	I	SH-0279
	1	BAI	1.2	//	SH-0284
	2	BAI	2.5	I	SH-0279
	10	BAJ	8.9	.	SH-0282
	3	BAJ	3.1	I	SH-0279
	2	BAX	1.8	//	SH-0284
	1	BAX	1.4	I	SH-0279
	1	CEH	3.5	L	SH-0280
	1	CEI	2.1	A	SH-0275
	1	CEJ	1.0	M	SH-0268
	2	CEL	6.1	S	SH-0281
	1	CEM	1.1	S	SH-0281
	1	CEM	1.2	V	SH-0214
	1	CEX	.6	V	SH-0214

DATE: 82/06/30 B.C. FOREST SERVICE SCALE 60
---SUMMARY BY BUNDLE---

SHOAL ISLAND DLS INCOMING BOOM: KI-0003 KNIGHT INLET

---INCOMING--- RC.-SEQ BUNDLE MARK	PIECES	SPECIE GRADE	CUBIC METRES	--OUTGOING-- SORT	BOOM
	1	HEH	3.9	I	SH-0279
	4	HEI	13.4	I	SH-0279
	20	HEJ	14.7	.	SH-0282
	1	HEJ	2.0	I	SH-0279
	1	HEX	3.9	//	SH-0284
	3	HEX	.9	X	SH-0283
	1	HEY	1.0	//	SH-0284
	2	SPH	10.2	SP	SH-0244
	61 *		87.6 *		
034-0083 0040 17/7	1	BAC	1.9	.	SH-0282
	1	BAC	2.1	I	SH-0279
	1	BAI	1.8	//	SH-0284
	3	BAI	7.5	I	SH-0279
	10	BAJ	7.6	.	SH-0282
	1	BAJ	1.0	I	SH-0279
	1	BAJ	.8	X	SH-0283
	3	BAX	.4	.	SH-0282
	2	BAX	4.4	//	SH-0284
	8	BAX	2.6	X	SH-0283
	2	BAY	4.2	//	SH-0284
	2	BAY	.4	X	SH-0283
	2	HEH	7.0	I	SH-0279
	1	HEI	1.5	//	SH-0284
	1	HEI	1.3	I	SH-0279
	1	HEJ	.3	.	SH-0282
	1	HEJ	1.1	//	SH-0284
	1	HEX	.6	.	SH-0282
	3	HEX	3.7	//	SH-0284
	1	HEX	2.7	I	SH-0279
	8	HEX	3.4	X	SH-0283
	6	HEY	16.8	//	SH-0284
	60 *		73.1 *		
034-0084 0041 17/7	2	BAH	4.7	I	SH-0279
	1	BAI	1.5	//	SH-0284
	2	BAI	2.8	I	SH-0279
	4	BAJ	3.1	.	SH-0282
	6	BAJ	9.4	I	SH-0279
	1	BAX	.4	.	SH-0282
	4	BAX	7.9	//	SH-0284
	4	BAY	4.7	//	SH-0284
	1	BAY	.2	I	SH-0279
	1	CEH	2.2	A	SH-0275
	2	CEJ	2.3	A	SH-0275
	1	CEX	.3	V	SH-0214
	1	FID	7.0	F	SH-0273
	1	FIH	5.8	+	SH-0267
	3	FIH	18.3	F	SH-0273
	1	HEH	5.4	I	SH-0279
	1	HEI	.6	.	SH-0282
	8	HEJ	5.6	.	SH-0282

SHOAL ISLAND DLS INCOMING BOOM: KI-0003 KNIGHT INLET

---INCOMING--- SEQ BUNDLE MARK	PIECES	SPECIE GRADE	CUBIC METRES	--OUTGOING-- SORT	BOOM
	1	HEJ	.8	I	SH-0279
	2	HEX	1.4	.	SH-0282
	1	HEX	4.4	//	SH-0284
	1	HEX	.2	X	SH-0283
	49 *		89.2 *		
034-0085 0042 17/7	1	BAC	2.4	I	SH-0279
	3	BAH	8.3	I	SH-0279
	7	BAI	17.2	I	SH-0279
	13	BAJ	8.9	.	SH-0282
	1	BAJ	.1	X	SH-0283
	5	BAX	1.7	.	SH-0282
	2	BAX	1.4	//	SH-0284
	3	BAX	1.2	X	SH-0283
	3	HEI	9.0	//	SH-0284
	2	HEI	4.6	I	SH-0279
	1	HEJ	.7	.	SH-0282
	1	HEJ	.2	X	SH-0283
	3	HEX	1.1	.	SH-0282
	4	HEX	7.6	//	SH-0284
	4	HEX	4.6	I	SH-0279
	3	HEX	1.5	X	SH-0283
	3	HEY	4.3	//	SH-0284
	59 *		75.2 *		
034-0086 0043 AMV	2	BAX	.5	X	SH-0283
	1	BAY	.1	X	SH-0283
17/7	1	BAJ	.3	.	SH-0282
	1	BAX	1.1	//	SH-0284
	1	BAX	.3	X	SH-0283
	1	CEL	1.5	S	SH-0281
	1	FIX	1.5	LR	SH-0274
	8 *		5.3 *		
034-0087 0044 17/7	3	BAH	15.6	I	SH-0279
	1	BAI	.8	.	SH-0282
	1	BAI	5.9	//	SH-0284
	7	BAI	26.5	I	SH-0279
	10	BAJ	6.4	.	SH-0282
	2	BAX	.5	.	SH-0282
	2	BAX	2.1	//	SH-0284
	4	BAX	1.7	X	SH-0283
	2	HEI	4.1	I	SH-0279
	1	HEJ	.8	.	SH-0282
	1	HEJ	.5	X	SH-0283
	1	HEX	.5	.	SH-0282
	1	HEX	1.1	//	SH-0284
	1	HEX	.5	I	SH-0279
	3	HEX	2.3	X	SH-0283
	4	HEY	7.8	//	SH-0284
	1	SPI	6.5	SP	SH-0244
	1	SPX	1.9	//	SH-0284

* LOOSE LOGS WITH SPILLAGE FROM ONE OR MORE BUNDLES.

DATE: 82/05/30 B.C. FOREST SERVICE SCALE 62
---SUMMARY BY BUNDLE---

SHOAL ISLAND DLS INCOMING BOOM: KI-0003 KNIGHT INLET

----INCOMING------- SEQ BUNDLE MARK	PIECES	SPECIE GRADE	CUBIC METRES	--OUTGOING-- SORT	BOOM
	1	SPY	2.7	//	SH-0284
	47 *		88.2 *		
034-0088 0045 17/7	2	BAH	6.4	I	SH-0285
	1	BAI	.8	//	SH-0284
	3	BAI	4.8	I	SH-0285
	1	BAI	1.2	X	SH-0283
	9	BAJ	5.8	.	SH-0282
	2	BAJ	.3	X	SH-0283
	2	BAX	1.0	.	SH-0282
	4	BAX	4.1	//	SH-0284
	1	BAX	.5	X	SH-0283
	1	BAY	.3	X	SH-0283
	1	CEJ	1.5	V	SH-0268
	1	CEM	.6	S	SH-0281
	2	FII	5.4	LH	SH-0274
	2	FIJ	.9	O	SI-0154
	1	HED	6.5	I	SH-0279
	1	HEH	3.0	//	SH-0284
	2	HEI	3.8	//	SH-0284
	1	HEI	1.6	I	SH-0279
	1	HEJ	.3	.	SH-0282
	1	HEJ	1.0	X	SH-0283
	5	HEX	2.9	.	SH-0282
	1	HEX	2.2	//	SH-0284
	1	HEX	1.0	I	SH-0285
	3	HEX	1.5	X	SH-0283
	1	SPH	10.0	SP	SH-0244
	1	SPI	1.7	SP	SH-0244
	1	SPX	.8	X	SH-0283
	52 *		69.9 *		
034-0089 0046 17/7	1	BAC	1.4	I	SH-0285
	1	BAH	1.4	//	SH-0284
	2	BAH	5.0	I	SH-0285
	1	BAI	.6	//	SH-0284
	6	BAI	8.8	I	SH-0285
	7	BAJ	4.2	.	SH-0282
	2	BAJ	2.7	I	SH-0285
	3	BAJ	1.9	X	SH-0283
	2	BAX	1.9	.	SH-0282
	1	BAX	1.2	//	SH-0284
	1	BAY	.3	X	SH-0283
	1	CEI	3.7	A	SH-0275
	1	CEJ	1.4	A	SH-0275
	1	CEJ	.4	V	SH-0214
	1	CEM	1.4	S	SH-0281
	2	FIH	11.2	+	SH-0267
	1	HEI	1.5	.	SH-0282
	1	HEI	1.4	//	SH-0284
	3	HEI	6.4	I	SH-0285
	21	HEJ	12.2	.	SH-0282

DATE: 82/06/30 B.C. FOREST SERVICE SCALE 63 47433
---SUMMARY BY BUNDLE---

RHOAL ISLAND DLS INCOMING BOOM: KI-0003 KNIGHT INLET

---INCOMING--- RE--SED BUNDLE MARK	SPECIE PIECES	GRADE	CUBIC METRES	--OUTGOING-- SORT	BOOM
	2	HEJ	3.2	1	SH-0285
	10	HEJ	5.2	X	SH-0283
	1	HEX	1.0	//	SH-0294
	4	HEX	2.5	X	SH-0283
	76 *		80.9 *		
BOOM TOTAL 46 **	2962 **		3324.0 **		

THESE WERE PROBABLY 45 BUNDLES IN THIS BOOM NOT 46 (SEE BUNDLE # 43)

May 13, 1985

Mr. D. T. Grant, R.P.F.
Regional Manager
Ministry of Forests
4595 Canada Way
Burnaby, B.C.
V5G 4L9

Dear Mr. Grant:

Re: Shoal Island Inquiry

I have now had an opportunity to examine the various submissions arising out of my report to you of February 7, 1985. It is not my intention to present a detailed discussion of these submissions here. Rather, I wish to comment only on those points being made which bear most directly on issues raised in my earlier report.

I was asked to evaluate the statistical aspects of the arguments put forward by all parties to the inquiry. Since the text of my report was rather detailed, I felt a concluding section summarizing my findings would be helpful to you. Although I attempted to write this section of my report (pp. 85-89) very carefully, the discussion in the submissions indicates that some confusion has resulted. Let me therefor attempt to clarify my conclusions as follows:

1. I was uncertain of the relevance of the check scale data presented by B.C.F.P. (see p. 61).

2. I was not convinced of the validity of the method proposed by the contractors to impute the volume shortfall for the period in dispute (for the many reasons detailed throughout the report).

3. I was uncertain of the relevance of the results of Shadforth's scales of May, June and July 1981 (since the procedures employed had not been reported) and the utility of the crude summaries reported for the Whittaker-Burdge "120 working day" comparison. While I anticipated that

both these sources might provide useful information once more detail was presented, it did not appear possible to make use of this information in the form presented.

4. The remaining relevant quantitative information appeared to be that of the check scales of September 1-4, September 21-25 and October 4-9, 1981. I interpreted the results of these check scales as rendering inevitable the conclusion that 'logs could be missed with the procedures then in use by the Ministry of Forests' scalers at Shoal Island' (p. 86).

5. I noted that the problem appeared to be in the scaling procedure and not the scaling itself. I agreed that one would expect some variability 'due to factors such as the scaler, the sort of log, the weather, and so on' (p. 88) and noted that 'if available in a detailed enough form, the data from each of these check scales could provide some information on the variability of results' (pp. 88-89; the same point had been made earlier on pp. 60-61).

6. I suggested that of these three check scales, that of September 1-4, 1981 would provide the most reliable assessment of the magnitude of the problem since one would expect that conditions under which the check scales were carried out were less and less like normal operation conditions over successive check scales (Whittaker seems to support this view in both Appendices B and J of the Ministry of Forests' brief). The apparent improvement over successive check scales would appear to support this contention. While the scalers would have been aware they were being check-scaled even on the occasion of this first check scale, nothing in what was presented suggested the scalers would have suspected any problem. Indeed, Ministry of Forests' check scales had been carried out at various times prior to that date without any untoward results. On the other hand, since the fact that a check scale was being carried out might cause the scalers to work somewhat more carefully and might also reduce the pace of the work, I noted that 'an assessment based on the results of the check scale of September 1-4, 1981 . . . may well understate the magnitude of the problem' (p. 89; the same point had been made earlier on p. 37).

7. I very explicity noted that using the results of the check scale of September 1-4, 1981 'to infer the magnitude of the problem for the entire period (in dispute) does require a consistency assumption concerning the scaling procedure' (p. 89). Since the procedures at Shoal Island remained unchanged throughout the period in dispute, the assumption 'concerns a measurement process which might (emphasis added) be expected to be stable over time' (p. 89) and might therefor not be unreasonable.

8. I purposely did not suggest any particular figure as an appropriate assessment of the magnitude of the problem. As indicated, my intention was that at the very least the sources of variability in the data corresponding to the check scales of September 1-4, September 21-25 and October 4-9, 1981 should first be examined carefully. In addition, I anticipated that some useful information might be extracted from the results of Shadforth's scales of May, June and July 1981 and the Whittaker-Burdge "120 working day" comparison. Certainly, all possible relevant information should be examined carefully before attempting an assessment of the magnitude of the problem.

Some comments on the individual submissions follow:

A. Kyuquot Logging Ltd.

1. Schedule I presents a revised production analysis for the period 1974-1980 including a split of the 1978 data into pre and post Shoal Island start-up. This split of the 1978 data differs somewhat from those provided by other sources (see p. 14 and p. 38 of my report) and is challenged by B.C.F.P. in its later submission of April 1, 1985. This again illustrates the apparent difficulty of determining accurate values for data which is essential to the arguments put forward by the contractors.

2. The calculation referred to on p. 16 is clearly outlined on pp. 14-15 of my report: 668 pre-loads with a scaled volume of 40,450 c.m. leads to a load average of 60.55 c.m. while 1851 post-loads with a scaled volume of 152,682 - 40,450 = 112,232 c.m. leads to a load average of 60.63 c.m. (larger than 60.55). Of course, if the 6% adjustment for sinkage is added to the pre-load average this ordering is reversed, but this 6% adjustment is one of the features of the arguments put forward by the contractors which has not been adequately justified.

3. On p. 19, Kyuquot indicates that B.C.F.P. provided a plus 20% adjustment to Kyuquot's estimate (based on nominal yearly load average) in recognition of Kyuquot's conservative estimating system. If this is so (there is no written indication as to why the plus 20% adjustment is made), this would certainly counter comment C.(i).6 on p. 29 of my report.

B. Traer & Mahood Contractors Ltd. et al

1. Appendix I: Crawford E. Laing Report

1.1 On p. 7, it is claimed that during the check scale of September 1-4, 1981, 'conditions had been improved radically' and 'there was a radically different procedure for scaling, and an environment not at all representative of the procedures and environment in the period under dispute'. While Whittaker's letter (Appendix B of the Ministry of Forests' brief) makes it clear that Shadforth and Woodrow used a different procedure for scaling than the official scalers, no suggestion is made there that the official scalers used anything other than their normal procedures (albeit possibly working somewhat more carefully since they were aware a check scale was being carried out). This is an important point which needs to be clarified if the results of this check scale are to be employed.

1.2 Table 3.1 on p. 8 suggests that Shadforth and Woodrow actually underscaled during the check scale of September 1-4, 1981; this appears to be the first instance in which this suggestion has been explicitly made (the suggestion also appears on p. 12 of Appendix II and in paragraph 7.2 of p. 4 of the text of this submission). Given that 'Shadforth and Woodrow scalers did not segregate their logs according to company grade codes and therefore had a simpler task' (p. 1 of Appendix B of Ministry of Forest' brief), is there any reason to anticipate the suggested substantial underscales by Shadforth and Woodrow? An alternate conclusion which might be suggested by Table 3.1 is that the expected volumes as calculated by the SYTLAV/CEL factor are simply much too large.

1.3 The calculations in both Schedule III of the Thomson report and the earlier Crawford E. Laing report (Appendix II of the Traer & Mahood Contractors Ltd. et al brief) were clearly presented as assessments of the level of variability in what were reported there as loads. These calculations were then relied upon to assert statistical accuracy and reliability for the truck load average method of determining volume. The comments in my report (especially comments A.18.7 on pp. 18-20 and C.(ii).1.6 on pp. 35-36) concerned only what was done, not what possibly should have been done.

In the present report, different calculations are presented in Tables A through W of Appendix A as assessments of 'the level of variation in the truck load average volume from boom to boom' (p. 14); the booms are now considered the basic entities. Thus the data of Table A of Appendix A is now considered to consist of the seven SYTLAV/CEL factors 0.739, 0.740, . . ., 0.827 corresponding to the seven booms listed in the table. The average and standard deviation of these seven observations are 0.781 and 0.036 respectively (Table A reports a weighted average of 0.787 and a weighted standard deviation

of 0.031; these slightly different values are obtained by weighting the individual observations by the number of loads in the corresponding boom); this standard deviation indicates the amount of variability in these seven SYTLAV/CEL observations. In general, the average and the standard deviation provide a convenient summary for most sets of numbers: a rough rule (particularly appropriate for sets of numbers with a histogram that is at least approximately symmetric) is that about two-thirds of the numbers will lie within one standard deviation of the average, while almost all the numbers will lie within two standard deviations of the average.

As was the case in both Schedule III of the Thomson report and the earlier Crawford E. Laing report, the major difficulty with these calculations arises at the next step where a 'standard error of mean' is reported. As noted in comment A.18.7 on pp. 18-20 of my report, the calculation leading to this quantity (for Table A of Appendix A, for example, $0.031/\sqrt{7} = 0.012$) is appropriate only in the case that the set of observations corresponds to a simple random sample drawn with replacement from a particular population. The different sets of observations in Tables A through W of Appendix A very clearly do not correspond to simple random samples and I can see no convincing argument that these different sets of observations can be considered as if they did correspond to simple random samples. Certainly they can be thought of as samples from a larger "population", but not simple random samples! As before, the reported 'standard error of mean' and therefor the confidence limits which follow have no meaning.

1.4 Much of the discussion on pp. 13-17 (especially the last paragraph on p. 16) misses the point of comment A.18.7 of my earlier report. As indicated above, my main point was that the calculations of 'standard error of mean' and subsequent confidence limits simply had no meaning in this situation. If

all the data for Sallie Creek for 1982 is available, then this tells us everything about booms from Sallie Creek in 1982 (without any uncertainty, assuming the data is accurate). Of course, it is unclear what this tells us about booms from Sallie Creek in other years, or about booms from other locations in any year.

1.5 On p. 18, an adjustment to cross-section 'to allow for the peaking loading of a "low stake" truck' is mentioned; this adjustment is listed as a factor of 1.2 in Table 5.2 on p. 20. This adjustment is critical to the argument that Kyuquot's results prior to the start-up of Shoal Island are comparable to Traer & Mahood's results after 1981. How was this adjustment determined?

1.6 In addition to data presented previously, Appendix A also provides 1984 data for Traer & Mahood in Tables I and J. The weighted average (over the different booms) SYTLAV/CEL factors in these two tables are 0.787 and 0.792 which are very consistent with the 0.787 value obtained for the 1982 and 1983 Traer & Mahood data (Tables A, B, C, D).

2. Appendix II

2.1 On p.3, the results in Tables Q and L of 'the Laing Response' are interpreted as revealing 'consistent accurate scale' prior to Shoal Island and subsequent to 1981 respectively. While some degree of consistency is revealed in these tables (weighted standard deviations = 0.031 and 0.047 respectively), I fail to see how these tables demonstrate accuracy of the scaling in those periods.

2.2 In paragraph 4.0 of p. 4 , there appears to be agreement with my suggestion that a consistency assumption concerning the scaling procedure might not be unreasonable (the same agreement

appears in paragraph 9.2 of p. 6 of the text of this submission).

2.3 The discussion of the Whittaker-Burdge data on pp. 9-12 does not answer Hutchings' question of 'Why are the company operations underscaled less than the contractors?' The argument that 'it is illogical that the contractors production would be processed with underscale of 15.9% and company production would have virtually no underscale' (p. 12) is presumably exactly why Hutchings asked the question. This is an important point which needs to be clarified if the results of this comparison are to be employed.

3. Appendix III

3.1 The description of Shadforth's scale (pp. 1-3) makes it doubtful that his scaling should be considered 'a random scale of load bundles' (paragraph 6.0 on p. 2). Is the procedure described such that the results can be directly compared to the results obtained by the official scalers at Shoal Island?

3.2 It is unclear how Shadforth determined whether a load bundle corresponded to a small or large truck. Note that on the third page of Shadforth's data sheets, load 5 appears to consist of two bundles, one marked 17/10 and consisting of 46 pieces scaled at 48.8 c.m. and the other marked 17/11 and consisting of 38 pieces scaled at 81.3 c.m. These are identified as two small load bundles, but the second of these appears unusually large for a small load bundle.

4. Text of Submission

4.1 On p. 8, the argument is made that 'these entities (booms), or units, are capable of being utilized as <u>random</u> (emphasis added) samples'; I disagree most strongly. As noted in comment B.1.3

above, I can see no argument justifying this assertion; simply saying it is so does not make it so!

Note: The later submission of April 4, 1985 contains a few revisions to this submission, but has no effect on the above comments.

C. Ministry of Forests

1. The Ministry of Forest' brief submission echos my own concern that the records and the data corresponding to the check scale of September 1-4, 1981 (and other relevant sources) be examined carefully before a decision is made on whether it is possible and how to assess the magnitude of the problem.

D. British Columbia Forest Products Ltd.

1. In the discussion of "Assumption No. 1' on p. 10, the suggestion is made that the check scale of September 1-4, 1981 'was requisitioned for booms which had been selected (emphasis added) by Traer & Mahood Contractors Ltd.' and that 'the probability of finding a shortfall in such circumstances would not be typical'. As already indicated, the details concerning this check scale need to be clarified.

2. In the discussion of "Assumption No. 2' on p. 11, the suggestion is that one might expect some variability in scaling error due to factors such as 'grades, species and sizes of logs being processed'. I certainly agree; the real issue 'is whether or not such variation is negligible or must be taken into account' (p. 88 of my report). As already noted, the check scale data should be examined carefully to address this issue.

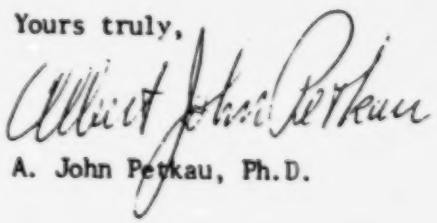
3. The discussion of 'Assumption No. 3' on pp. 13-17 contains a number of valid points. The issue is whether or not the 'consistency assumption concerning the scaling procedure' (p. 89 of my report) is

reasonable. As already noted, I merely suggested that such an assumption might be reasonable. If it is, then it would seem possible to make an assessment of the magnitude of the problem, albeit an assessment 'which may well understate the magnitude of the problem' (p. 89 of my report); if it is not, then based on the evidence presented there would seem to be no way of making a reasonably reliable such assessment.

Note: The later submission of April 1, 1985 makes a number of points on which I feel no need to comment.

I trust these comments will be useful to you.

Yours truly,



A. John Petkau, Ph.D.

I should mention that in the process of considering these submissions, I discovered a few typographical errors in my report; there may of course be others. Those I found follow:

1. p. 28, l. 3b: 198i - 1978 (as pointed out by Kyuquot on p. 18 of its submission)

2. p. 60, l. 1b: anology - analogy

3. p. 61, l. 3: happended - happened

4. p. 81, l. 5-6: low stakes - high stakes

5. p. 81, l. 10: page 50 - page 60

6. p. 81, l. 9, 13: Reid's 1982 data should not be included here since Reid's reported cedar content exceeded 26% in 1982.

Province of British Columbia | Ministry of Forests

INTEROFFICE MEMO

DATE: 85.05.14

FILE NUMBER: V15

TO: H. J. WHITTAKER

FROM: A. MOODY

SUBJECT: Per your request and for your information.

MAY 14 1985

A. Moody

REGIONAL SCALING COORDINATOR

Province of
British Columbia

Ministry of
Forests

JUN 04 1985
[illegible] OFFICE

DATE: April 2nd 1985

FILE No.

SUBJECT: SHOAL ISLAND DRY LAND SORT

ATTENTION OF: Mr.A.D.Moody
REGIONAL SCALING CO-ORDINATOR

REMARKS:

The following is a breakdown of my activities on the Shoal Island dry land sort during 1979,1980,and 1981 excluding the check scaling programme conducted by the Ministry of Forests during the weeks of Sept.21 to 25/81 and Oct.4 to 10/81.

Nov.6/79 ..... Saw Log Appraisal Project.....Supervision

Feb.12/80 .... Saw Log Appraisal Project .... Supervision

~~Nov.~~ Dec.10/80 .... Check Scale ..... Raft FD 323

~~Nov.~~ Dec.11/80 .... Check Scale ..... Raft WC 244

~~Nov.~~ Dec.12/80 .... Coaching

Jan.15/81 .... Routine Supervisory visit of transient scaling station.

I.C.McGraw
Scaling Supervisor

FS 75 LAS 81/8

Province of British Columbia

Ministry of Forests

DATE: April 2, 1985

JUN 21 1985

FILE No.

SUBJECT: Shoal Island Dry Land Sort

ATTENTION OF: A.D. Moody, Regional Scaling Coordinator

REMARKS: Listed below are the dates that I was involved with scaling at Shoal Island Dry Land Sort.

July 4/78 - Inspected Shoal Island Dry Land Sort.
July 5/78 - Assisted J. Bendick with scaling on Dry Land Sort.
July 17/78 - Coached Ivan LaCouvee at Shoal Island.
July 18/78 - Check Scaled WSSC 104K on Jack Pearce (PC112) D047.
Aug. 29/78 - Scaled two parcels of logs comparing old grades to new grades.
Nov. 30/78 - Metric coaching and set up Metric Log Exam.
Jan.11/79 - Held Metric Exam at Shoal Island.
Sept. 12/80 - Coached on new grading rules at Shoal Island.

D. Doig

D. Doig,
Scaling Supervisor

DD/jb

FS. 75 LAS 81/8

FOREST SERVICE

Province of British Columbia

FILE NO. _____

DATE MAY 15/85

SUBJECT DUTIES DURING THE PERIOD OF 1978 TO 1981

ATTENTION OF:

A. MOODY.
REGIONAL SCALING CO-ORDINATOR.

REMARKS I WAS APPOINTED INSPECTOR OF LICENSED SCALERS. AND EXPORT IN NOVEMBER OF 1978. I HELD THAT POSITION UNTIL RESUMMING. THE DUTIES OF A SCALING SUPERVISOR IN. FEBRUARY OF 1981

THE FIRST TIME I WAS AT SHOAL ISLAND D.L.S. WAS TO CHECK SCALE WITH FOUR OTHER VAN. SCALERS. THE WEEK OF SEPT 21-25 1981

SIGNATURE E.P. Monteith.

Province of British Columbia | Ministry of Forests

INTEROFFICE MEMO

March 12 1984

TO: Vancouver Regional Off. FROM: Squamish District Office

ATTN: Al Moody

JUN 01 1985

SUBJECT:

Please find enclosed Copy of check scale as requested by Dan McGraw.

Thes were removed from file of Cathy Waiter at Squamish District Office.

Thank you.

Eileen C. Beck
for A.R. Hoyle D.O. Scaling

FS 257 (AS 82 4)

F.D.

F.D.

DATE 1980	ORIGINAL	RAFT NO.	BOOM NO.	SECS	SPECIE	PCS	CUBIC H %	CUBIC L %	VALUE H %	VALUE L %	JIM FRASER REMARKS	CHEC BY
Mar 21	C-14	1	EAST 1	2	H	81	28½		.021			
Apr 25	C 25	2	" 2	2	CE	102	1.67			1.02		
May 16	JZ 117	3	8-040-0-Box	4	HB	102		1.33		327		
June 9	C C52	104	KC051A	3.5	CE	159	4.24		3.32			
June 23	SK 111	116	SCT-0-3-9	6	CG	317		1.96		7.62		
" 25	YT ~~1981~~ 1981	117	SCT-0-3-5	6	CE	267		1256		184		
80 06 11	N.B 1-8	105	BS.051-A	6	"	365		1.61		2.09		
80 06 26	CB 132	118	SCT-0-3-15	2.5	CH	131		7.66		7.77		
80.06 12	C 054	106	TTB-1	5	FI	748		2.48		114	?	
80.06 21	NW 078	115	SCL-0-5	7	"	464		1121		1.55	?	
80 [illegible] 16	WR 225	107	Log. 9-297	7	HE	213		532		7.4		
~~80 10 06~~		208	91:25	—	—	26	.2					McGee
~~80.11.08~~		217				21	3.4					"
80.12.10	~~FD 32~~	323	12S-CCO-K	D.L.S	HE	217	4.48		4.12		SHOAL ISLAND	McGRA
			1981									
81 02 25	MITCHELL Is	81	Log #5	3	FI	142		3.27		3.86		DOIG
81.03.02	"	82	Log-390	4	"	196		4.44		11.7		"
81 03.25	ELLIOTT RD	91	Log-39	4	"	213		6.5		4.13		MANTEI
81.07.30		190	NHA-5-14	3.5	SP	138		2.46		2.18		McGRA
81.08.05		197	SD-070-B	5	CE	288	1.14			5.45		MANTEI
81.08.07		199	PSHK-1103	6	SP	224		8.29		15.58		"
81.08.09		200	SD-061-B	5	CE	305	2.39			2.07		"
81.08.20		202	SD-062-B	5	"	282	1.16		.73			"
81 " 21		203	DC-1-23	4	HE	146		1.73		2.72		"
			1982									
82.04.01	SEELEYS	058	82-0231-0-MM	4	CE	172	3.54		3.99			BOBOLE
82.04.05	DUCK Is.	059	TARM 12-3	6	SP	283		.12		.56		MONTEI
82-04-15	BARNSTON Is	064	CM CM81-137	4	FI	194	12.21		1.254			"
82-03-30	DUCK Is.	014	LS 1802 B	2	SPL	65	2.56		2.31			BABOLE
82-07-14	BESTWOOD	167	WM 2-24	6	FI	291	2.4				PIECES MISSING HAVE ON H'S	ZONEY G PAWD
82-07-24	"	181	TR 16 B	4	HE	165	3.7					MONTEI
83 03 15	McDONALD SK	212	FWMC 2-97	4	CE	267	8.0		2.48		MESSY COAL	DOIG
83 04 19	QUARSINO	302	TMH-17-12	LONG	HB	37		366			DIFFICULT SEAMING	DOIG
83 11 22	KOKISH	648	000 431	5	MIX	35	.96				NORMAL SEAMING	McGEE
83 12 12	GWWD	682	LOAD 1	MIX	MIX	29	4.17				VERY DIFFICULT	MONTEI
"	"	"	2	"	"	22	3.39				"	"
"	"	"	3	"	"	20	11.26				"	"
"	"	"	6	"	"	17	7.36				"	"
"	"	"	7	"	"	27		2.21			MEDIUM DIFFICULT	"
"	"	"	8	"	"	21	3.4				"	"

F.D.

F.D.

DATE 1980	ORIGINAL	RAFT NO.	BOOM NO.	SECS	SPECIES	PCS	CUBIC H %	CUBIC L %	VALUE H %	VALUE L %	REMARKS (Jim Fraser)	CHECK BY
Mar 21	C-14	1	EAST 1	2	H	81	28%		0.21			
Apr 25	C 25	2	" 2	2	CE	102	1.67			1.02		
May 16	JZ 117	3	RC-0407-0-Bank	4	WH	102		1.33		3.27		
June 9	C C52	104	KC051A	3.5	CE	159	4.24		3.32			
June 23	SK 111	116	SCT-0-3-9	6	CE	317		1.96		7.62		
" 25	YI ~~151~~	117	SCT-0-3-5	6	CE	267		1256		184		
80.06.11	N.B 118	105	CDS.051-A	6	"	363		1.61		2.09		
80.06.26	CB 132	118	SCT-0-3-15	2.5	CH	131		7.62		7.72		
80.06.12	C 05W	106	TTB-1	5	FI	248		2.48		11.4	?	
80.06.21	NW 078	115	SCL-0-5	7	"	464		11.21		11.55	?	
80 16	WR 225	107	Unn. 9-297	7	HE	213		5.32		7.44		
80.06.26		208	71-25	—	..	26	0.2			..		McGee
80.07.08		217				21	3.1					"
80.12.10	~~FD 32~~	323	1245.660.K	D.L.S	HE	217	4.13		4.12		SHOAL ISLAND	McGRA
			1981									
81.02.25	MITCHELL Is	81	L2K-5	3	FI	142		3.27		3.86		DOIG
81.03.02	"	82	L2K-390	4	"	196		4.44		11.7		"
81.03.25	ELLIOTT RD	91	L2K-39	4	"	213		6.5		4.93		MONTE
81.07.30		190	NHA-5-14	3.5	SP	138		2.46		2.18		McGRA
81.08.05		197	SD-070-B	5	CE	288	1.14			5.45		MONTE
81.08.07		199	PSHK-1103	6	SP	224		8.29		15.58		"
81.08.09		200	SD-061-B	5	CE	305	2.39			2.07		"
81.08.20		202	SD-062-B	5	"	382	1.16		.73			"
81 " 21		203	DC-1-23	4	HE	146		1.73		2.72		"
			1982									
82.04.01	SEEDYS	158	82-2231-0-AA	4	CE	178	8.54		8.99			DOBOLE
82.04.05	DANK Is.	159	TANK 12-3	6	SP	243		.12		.56		MONTE
82-04-15	CRAGSTAN Is.	164	CM CM81-137	4	FI	194	12.21		1.254			"
82-03-30	DANK Is.	014	LS 1802 B	2	SPL	45	2.56		.231			BARDOLF ZONE 6 Thinn
82-07-14	BESTWOOD	167	WM 2-24	6	FI	391	2.4				FILLER MISSING HIGH ON 'H's	
82-07-20	"	181	IR 16 B	4	HE	165	3.7					MONTE
830315	McDONALD St.	212	Fume 2-97	4	CE	267	8.0		2.48		MOOSE CREEK	DOIG
830419	QUADRA NO	302	TUHU-17-12	LOAD	HE	37		3.66			DIFFICULT SCALING	DOIG
831122	KOKISH	648	000431	5	MIX	35	.96				NORMAL SCALING	McGee
831212	GLIWD	682	LOAD 1	MIX	MIX	29	2.17				VERY DIFFICULT	MONTE
"	"	"	2	"	"	22	3.39				" "	"
"	"	"	3	"	"	20	1.20				" "	"
"	"	"	6	"	"	17	7.56				" "	"
"	"	"	7	"	"	27		2.21			MEDIUM DIFFICULT	"
"	"	"	8	"	"	21	3.4				" "	"

RPT:FVLP504002
JOB:FVLP5042

HARVEST DATA BASE SYSTEM
VOLUME REPORT

FIRST CHECK-SCALE OF CAMP BOOM NUM: PAS-666-K RAFT NUM: nC 244
SCALED BY: WALTER CATHERINE AT: SHOAL ISLAND DLS ON: 11 DECEMBER 1980
NUM. CHAINS: NUM. SECTIONS: COMPARED WITH M 175 SCALED BY: MCGRAW IAN C
PAYABLE BY:

MARKS ON TIMBER	PIECES	SPECIES	GRADE	DESCRIPTION	RATE	VOLUME-M3	LOG VALUE
F63014	141	BALSAM			28.91	105.1	3,038.44
F63014	6	BALSAM	4		8.95	5.2	28.64
F63014	78	HEMLOCK	3		26.19	75.7	1,982.58
F63014	2	HEMLOCK	4		8.86	.9	7.97
7C:	74	BALSAM			20.91	52.0	1,503.32
7C:	3	BALSAM	4		8.95	2.2	19.69
7C:	30	HEMLOCK	3		26.19	26.9	704.51
7C:	1	HEMLOCK	4		8.86	.2	1.77

SUMMARY BY SPECIES AND GRADES

215	BALSAM		157.1
9	BALSAM	4	5.4
108	HEMLOCK	3	102.6
3	HEMLOCK	4	1.1
TOTALS 335			266.2

THIS SCALE IS..... 16.35% HIGH & 15.13% HIGH

~~SCALED NOV. 12-DEC. 11~~

Dec 22/80
Gett: McGraw Check Scale
Issue
Jrs Tkt

Processed Dec 22/80
KG

SFR FV63681

Page 8.51 (1980 Timber scale record)

HARVEST DATA BASE SYSTEM
VOLUME REPORT

[illegible] CHECK-SCALE OF CAMP BOOM NUM: PAS-bob-K RAFT NUM: M 175
SCALED BY: MCGRAW IAN C AT: SHUAL IS DLS ON: 11 DECEMBER 1980
JM. CHAINS: NUM. SECTIONS:

PAYABLE BY:

MKS ON TIMBER	PIECES	SPECIES	GRADE	DESCRIPTION	RATE	VOLUME-M3	LOG VALUE
63014	126	BALSAM			28.91	82.7	2,390.86
63014	1	BALSAM	4		8.95	.3	2.69
63014	69	HEMLOCK	3		26.19	56.0	1,466.64
[illegible]	84	BALSAM			28.91	50.8	1,468.63
[illegible]	3	BALSAM	4		8.95	1.2	10.74
[illegible]	47	HEMLOCK	3		26.19	37.8	989.98

SUMMARY BY SPECIES AND GRADES

	214	BALSAM		133.5
	4	BALSAM	4	1.5
	116	HEMLOCK	3	93.8
TOTALS	334			228.8

Province of British Columbia — Ministry of Forests — FOREST SERVICE

SCALING COPY

SCALE AND ROYALTY INVOICE

VANCOUVER MD 11 12

DATE OF SCALING (DAY / MONTH / YEAR)	DATE OF ISSUE (DAY / MONTH / YEAR)	INVOICE NUMBER	PAGE NO
11 / 12 / 80	29 / 01 / 81	PV63681	1

SCALED AT: SHOAL IS. DLS

REGIONAL MANAGER: 3362175

RAFT NUMBER: M 179

SCALER'S NAME: MCGRAW IAN C FR01

NO OF CHAINS:

NO OF SECS:

CAMP BOOM NO: PAS-666-K

SCALED FOR:
BRITISH COLUMBIA FOREST PRODUCTS LIMITED
1050 WEST PENDER STREET
VANCOUVER, B.C.
V6E 2X5

VENDOR:
BRITISH COLUMBIA FOREST PRODUCTS LIMITED
CROFTON LOGGING DIVISION
P.O. BOX 130
CROFTON, B.C.

POSSESSION OF THIS SCALE BILL DOES NOT CONSTITUTE OWNERSHIP OF MATERIAL FOR WHICH SCALE IS INDICATED

MARKS ON TIMBER	SORT	NO OF PIECES	DESCRIPTION OF TIMBER	GRADE	SCALE MEASUREMENT CUBIC METRES	DOYLE CHART	RATE $	RATE ¢	AMOUNT
F63014	M	126	BALSAM		62.7	S	341		28201
F63014	M	1	BALSAM	4	.5	S	341		102
F63014	M	69	HEMLOCK	5	56.0	S	318		17808
		196			139.0				
WASTE 2		10.8%	(FOR CUT CONTROL ONLY)		15.0	M3			
7C1	M	88	BALSAM		50.8	M	120		6096
7C1	M	3	BALSAM	4	1.2	M	120		144
7C1	M	47	HEMLOCK	5	37.8	M	120		4535
		138			89.8				
		334	***TOTALS***		228.8				
			TOTAL ROYALTY			M			10776
			TOTAL STUMPAGE			S			46111
			TOTAL OF ALL SCALING CHARGES						
			TOTAL OF ALL CHARGES						56887

SUMMARY OF LOG VOLUMES

214	BALSAM		133.5
4	BALSAM	4	1.5
116	HEMLOCK	5	93.8
334			228.8

SUPERVISION CHECK SCALE REPLACES ORIGINAL NON-ISSUED SCALE BY C. WALTER, RAFT WC244. SCALING COSTS TO BE ASSESSED AT LATER DATE.

188934

TERMS: NET PAYABLE UPON RECEIPT SIMPLE INTEREST IS CHARGED AT A PRESCRIBED RATE TO PREVIOUS MONTHS BALANCE ON OVERDUE ACCOUNTS

PLEASE MAKE CHEQUE PAYABLE TO MINISTER OF FINANCE AND MAIL TO REGIONAL MANAGER AT APPROPRIATE REGION ADDRESS FOR EXPLANATION OF ... OF ACCOUNT

Province of British Columbia — Ministry of Forests — FOREST SERVICE

SUMMARY OF SCALE

S & R INVOICE NO: PV63681

SCALING ORDER NO: PV63681 (DC7)

PAGE	SEQ	TYPE	SCALERS NUMBER	RAFT	PREDOMINANT MARK	NUMBER OF CHAINS	CAMP BOOM NUMBER
0	0	0	3362	M			FAS-bbk-K

NO OF SECTIONS	DATE OF SCALING YR	MO	DAY	PAYABLE BY	SECOND COPY TO	EXPENSES	TIME CHARGE	LAUNCH
	80	12	11	0107	0378	—	—	

SCALERS SIGNATURE: I. McGRAW

VENDOR:

PAYABLE BY: 3 C F P

EXPENSES BREAKDOWN:

SEQ	TYPE	SCALERS LOG COUNT	Scaling Station Number	PLACE OF SCALING
0 0	1 1	334	HJ	SHOAL IS. I DIS I

PLACE OF SCALING (cont.):

SEQ	TYPE	MARK	PAINT	NMV	NUMBER OF PIECES	SPECIES	GRADE	OTHER DESC	QUANTITY m³	RATE $
0	0.2	F63214			126	BA			8.7	
0	0.3				1	✓H			.3	
0	0.4				69	HE	3		5.6	
0	- -									
0		7cm			EPEA				50.3	
0	0.7				3	✓H			1.2	
0	0.8				47	HE	3		37.8	
0	0.9									
0	1.0				224				2.3	
0	1.2				✓				✓	
0	1.3									
0	1.4									
0	1.5									
0	1.6									
0	1.7									
0	1.8									
0	1.9									
0	2.0									
0	2.1									
0	2.2									
0	2.3									
0	2.4									
0	2.5									
0	2.6									
0	2.7									
0	2.8									
0	2.9									
0	3.0									
0	3.1									
0	3.2									
0	3.3									
0	3.4									
0	3.5									

REMARKS:

Supervision checks, scale inspection original non-issued scale by C. Walter, staff W.C 244. Scaling costs to be assessed at later date.

P 4961

CLERICAL —

KEYED BY

VERIFIED BY ✓

Province of British Columbia — Ministry of Forests — FOREST SERVICE

SUMMARY OF SCALE

B & R INVOICE NO

SCALING ORDER NO

PAGE	SEQ	TYPE	SCALERS NUMBER	RAFT	PREDOMINANT MARK	NUMBER OF CHAINS	CAMP BOOM NUMBER
0	0 01		336 2175	M	CHECK		PAS-666-K

NO OF SECTIONS	DATE OF SCALING YR	MO	DAY	PAYABLE BY	SECOND COPY TO	EXPENSES	TIME CHARGE	LA FRANCHI
	80	12	11					

SCALER'S SIGNATURE: L. McLean

VENDOR: B.C.F.P. Sidney Is. Log. Div.

PAYABLE BY

EXPENSES BREAKDOWN

SEQ	TYPE	SCALERS LOG COUNT	Scaling Station Number	PLACE OF SCALING
0 01	1	334	HJSHAIG IS. I.D.S.	

PLACE OF SCALING (cont.)

SEQ	TYPE	MARK	PAINT	NEW	NUMBER OF PIECES	SPECIES	GRADE	OTHER DESC	QUANTITY m³	RATE $ ¢
0 02		FL3014			69	HE	3		–	
0 03					126	BA			–	
0 04					1	"	4		–	
0 05										
0 06		TCM			47	HE	3		–	
0 07					88	BA			–	
0 08					3	"	4		–	
0 09										
0 10					334					
0 11										
0 12										
0 13										
0 14										
0 15										
0 16										
0 17										
0 18										
0 19										
0 20										
0 21										
0 22										
0 23										
0 24										
0 25										
0 26										
0 27										
0 28										
0 29										
0 30										
0 31										
0 32										
0 33										
0 34										
0 35										

REMARKS: CHECK SCALE — RAFT WC 244

DR-1 LAND SORT. COMPLETE BOOM

CLERICAL

KEYED BY

VERIFIED BY

Province of British Columbia
Ministry of Forests
FOREST SERVICE

TALLY SHEET SCALE RETURN – LARGE

SCALER'S SIGNATURE: I McGown

SCALED FOR: BCFP. COAST LOG DIV

SCALING ORDER NO: PY 63093

LINE	SCALER'S NUMBER	DAFT	PREDOMINANT MARK	NUMBER OF CHAINS	CAMP BOOM NUMBER	NO OF SECTIONS	DATE YR	MO	DAY	PAYABLE BY	RECORD COPY TO	EXPENSES	TIMP CHARGE	SCALER-1 COUNT	SCALER-2 COUNT	PLACE OF SCALING
1	0 010 336 2175 [redacted]		M		PAS-666-K		80	12	11					1	1	334 HI SHOAL IS DLS

(C-13)

65

LINE	SCALER'S MARK	DAFT	NUMBER OF PIECES	SPECIES	OTHER DESC	TYPE – ENTER 2 in POSITIONS 12 – 32 CONTAIN IDENTIFICATION DATA; ENTER 2 in POSITION 32 – 52 CONTAIN LOG MEASUREMENTS
2	215 [redacted]		69	HE	3	V10 16 190 [illegible]
3	3 23 [illegible]					[illegible]
4	3 [illegible]					[illegible]
5	3 [illegible]					[illegible]
6	3 [illegible]					[illegible]
7	3 [illegible]					[illegible]
8	3 [illegible]					[illegible]
9	3 [illegible]					[illegible]
10	3 [illegible]					[illegible]
11	3 [illegible]					[illegible]
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26	2 [illegible]		126	HE		[illegible]
27	3 [illegible]					[illegible]
28	3 [illegible]					[illegible]
29	3 [illegible]					[illegible]
30	3 [illegible]					[illegible]
31	3 [illegible]					[illegible]
32	3 [illegible]					[illegible]
33	3 [illegible]					[illegible]
34	3 [illegible]					[illegible]
35	3 [illegible]					[illegible]
36	3 [illegible]					[illegible]
37	3 [illegible]					[illegible]
38	3 [illegible]					[illegible]
39	3 [illegible]					[illegible]
40	3 [illegible]					[illegible]
41	3 [illegible]					[illegible]
42	3 [illegible]					[illegible]
43						
44						
45	2 [illegible]		184			046 13 17

LINE	MARK	NUMBER OF PIECES	SPECIES	OTHER DESC	
50	2 [illegible]	49	HE	3	[illegible]
51	3 [illegible]				[illegible]
52	3 [illegible]				[illegible]
53	3 [illegible]				[illegible]
54	3 [illegible]				[illegible]
55	3 [illegible]				[illegible]
56	3 [illegible]				[illegible]
57					
58					
59					
60					
61					
62					
63					
64					
65					
66					
67					
68					
69					
70					
71					
72	2 [illegible]	88	LA		[illegible]
73	3 [illegible]				[illegible]
74	3 [illegible]				[illegible]
75	3 [illegible]				[illegible]
76	3 [illegible]				[illegible]
77	3 [illegible]				[illegible]
78	3 [illegible]				[illegible]
79	3 [illegible]				[illegible]
80	3 [illegible]				[illegible]
81	3 [illegible]				[illegible]
82	3 [illegible]				[illegible]
83	3 [illegible]				[illegible]
84					
85					
86					
87					
88					
89					
90					
91	2 [illegible]	32	LA		[illegible]
92					
93					

CHECK SCALE - FIRST WC SALE - DRYLAND SORT. Burrard Inlet

61.3

Province of British Columbia — Ministry of Forests

MEMORANDUM

To: Mr. A. C. MacPherson
Assistant Deputy Minister
Timber, Range & Recreation

From: J. A. Biickert

Date: April 2, 1984

File: 160-7
CONFIDENTIAL

Subject: Consolidation of Significant Data Collected for Shoal Island

Five significant and independent tests of Shoal Island scaling activities occurred between September 1, 1981 and March 30, 1984. These tests do not include the results of average load data extrapolated in the Thomson Report R8307, or the routine check scales performed by the Ministry. The test data results are expressed in terms of piece count and cubic metre volume differences and are presented separately in summary form for each of the five following test occurrences:

1. September 1st to 4th, 1981 check scales by Shadforth and Woodrow.

2. September 21st to 25th, 1981 check scales by Shadforth, B.C.F.P. and Ministry check scalers.

3. October 5th to 9th, 1981 check scales by Ministry check scalers and Ministry Official Piece Counter.

4. May 4th to October 24th, 1981 versus January 2nd to June 24th, 1982 "120-day" bundle scale comparison.

5. March 1984 comparative reanalysis of the Ministry's official scale of 36 random 1979, 1980 and 1981 Shoal out-turn booms versus B.C.F.P. sawmill inventory check scales of the same booms, as delivered at Delta Plywood (25 booms) and Tilbury Sawmill (11 booms).

.....2

PIECE COUNT RESULTS - TABLE 1

Test No.	Participant	Base	Pieces	%
1.	Ministry Official Scalers	6,763		
	Shadforth		7,146	105.7
	Woodrow		7,169	106.0
2.	Ministry Official Scalers	9,416		
	Ministry Check Scalers		9,385	99.7
	Shadforth		9,704	103.1
	B.C.F.P.		9,756	103.6
3.	Ministry Official Scalers	9,117		
	Ministry Check Scalers		9,122	100.1
	Ministry Official Counter		9,321	102.2
4.	Not Applicable - a test of annual bundle size consistency.			
5.	Ministry Official Scalers	19,855		
	Delta - B.C.F.P.		20,198	101.7
	Ministry Official Scalers	20,335		
	Tilbury - B.C.F.P.		20,965	103.1
			Weighted Average	102.9

SCALED VOLUME RESULTS - TABLE 2

Test No.	Participant	Base	Volume	%	By Test
1.	Ministry Official Scalers	8,860.0			
	Shadforth		9,586.1	108.2	106.4
	Woodrow		9,269.7	104.6	
2.	Ministry Official Scalers	11,853.7			
	Ministry Check Scalers		11,938.7	100.7	103.6
	Shadforth		12,624.0	106.5	
	B.C.F.P.		N/A	N/A	
3.	Ministry Official Scalers	12,643.8			
	Ministry Check Scalers		12,772.8	101.0	101.1
4.	1982 Average Bundle Size		64.70		
	1981 Average Bundle Size	59.51		108.7	108.7
5.	Ministry Official Scalers	45,888.0			
	Delta - B.C.F.P.		45,355.8	98.8	
	Ministry Official Scalers	18,528.2			98.7
	Tilbury - B.C.F.P.		18,245.3	98.5	
			Weighted Average by Test		103.67

Conclusions

1. Most tests reveal piece count shortfall exceeds cubic metre volume shortfall. A very probable explanation of this is that the pieces missed were smaller than average pieces in both length, particularly diameter and very probably in pulp grades. It is important to remember that since volume is the basis for billing, piece count should only be regarded as an indicator of the cause of volume shortfall.

2. Piece count tests indicate a shortfall (missed pieces) weighted average of 2.9 percent.

3. Scaled volume tests indicate a shortfall (of pieces not scaled) weighted average of 3.67 percent.

4. The test results range between 1.5% overscale to 8.2% underscale.

5. Bear in mind that Test 4 is a volumetric comparison of 1981 with 1982 bundle sizes and the Ministry in-house impression is that Shadforth tends to overscale. On the other hand, there is a good probability that Ministry Check Scalers emulated procedural errors similar to the official scalers. Since there are two contributing data values for both sides in Table 2, their difference may well be compensating and as such give additional credence to the 3.67% weighted average.

6. In due consideration of the data at hand, and the aforenoted conclusions, there is a good possibility that the magnitude of shortfall ranges strongly between 3 and 5% with a stronger tendency for a normalized mean sqewed on the downside at something less than 4%.

Observations

1. The new scaling procedure commenced October 26, 1981 and not January 1, 1982. No dissatisfaction is recorded nor shortfall contended as a result of its implementation.

2. According to the Thomson Report, Kyuquot Logging Ltd. is the only contractor contending a shortfall for the last half of 1978, and in such event, it is clear that the Ministry may not invoke section 87 of the Forest Act to estimate unscaled logs delivered to Shoal Island before January 1, 1979.

...5

3. The extrapolated bundle-size consistency argument presented in the Thomson Report fails to account for a considerable number of unmeasurable biases and variables and as such the results are statistically unreliable and should only be regarded as a hypothetical indicator of probable shortfall.

Recommendations

1. The Ministry may wish to reconcile the reasonable evidence of volume shortfall in missed logs by issuance of adjustment S & R Invoices and in doing so:

2. Constrain the period of adjustment between January 1, 1979 and October 26, 1981, and,

3. Constrain the actual adjustment to 3.67% for all contractors on their applicable volumes as previously S & R invoiced,

4. With the exception of those volumes already S & R adjusted between September 1 - 4, September 21 - 25 and October 5 - 9 (all in 1981) since this S & R adjustment average of 3.3% is significantly supportive of the 3.67% weighted average.

J. A. Bijckert
Special Advisor to
the Deputy Minister

JAB/mmm

JANUARY 1981

Alexander, S.	Cooper, G.	Major, M.	Vikstrom, J.
Atkinson, J.	Forbes, I.	Pearce, J.	Walders, B.
Bendick, J.	McIllfaterick, K.	Powell, R.	Walter, C.
Caldwell, B.	Magee, J.	Rossiter, F.	

FEBRUARY 1981

Atkinson, J.	Forbes, I.	Miller, K.	Roed, E.
Bendick, J.	Gannon, R.	Morrison, D.	Rossiter, F.
Cooper, G.	McLean, C.	Pearce, J.	Stephens, A.

MARCH 1981

Bendick, J.	Fraser, J.	McIllfaterick, K.	Roos, J.
Caldwell, B.	Gannon, R.	McLean, C.	Rossiter, F.
Cooper, G.	Hurford, A.	Morrow, C.	Vikstrom, J.
Cunningham, N.	LaFave, R.	Roed, E.	Walders, B.
Forbes, I.			

APRIL 1981

Anderson, G.	Flinn, B.	Harker, G.	Roos, J.
Bendick, J.	Forbes, I.	McLean, C.	Rossiter, F.
Cooper, G.	Fraser, J.	Morrison, D.	Vikstrom, J.
Cramb, I.	Gannon, R.	Morrow, C.	Zroback, W.
Davignon, J.	James, E.	Roed, E.	

MAY 1981

Atkinson, J.	McLean, C.	Rossiter, F.	Zubick, P.
Cooper, G.	Magee, J.	Totten, K.	
Forbes, I.	Morrow, C.	Vikstrom, J.	
Gannon, R.	Roos, J.	Walter, C.	

JUNE 1981

Atkinson, J.	Gannon, R.	Powell, R.	Totten, K.
Bendick, J.	McLean, C.	Roed, E.	Vikstrom, J.
Cooper, G.	Morrison, D.	Rossiter, F.	Vollet, D.
Forbes, I.	Pearce, J.	Stephens, A.	Walter, C.

JULY 1981

Bendick, J.	Forbes, I.	Powell, R.	Vikstrom, J.
Cooper, G.	Green, E.	Roed, E.	Vollet, D.
Cunningham, N.	McLean, C.	Rossiter, F.	

AUGUST 1981

NOT OPERATING

SEPTEMBER 1981

Atkinson, J.	Forbes, I.	McLean, C.	Steele, D.
Burton, T.	Fraser, J.	Morrison, D.	Vikstrom, J.
Bustin, P.	Gannon, R.	Morrow, C.	Zroback, W.
Cooper, G.	Harker, G.	Roed, E.	

OCTOBER 1981 (to the 23rd)

Bustin, P.	Fraser, J.	McLean, C.	Rossiter, F.
Cooper, G.	Gannon, R.	Magee, J.	Schaller, C.
Forbes, I.	Harker, G.	Roed, E.	

APRIL 1980

Bradley, J.
Cooper, G.
Forbes, I.
Gannon, R.
Hughes, R.
McLean, C.
McIllfaterick, K.
Magee, J.
Reid, W.
Reynolds, G.
Roed, E.
Trotter, B.
Vikstrom, J.

MAY 1980

Atkinson, J.
Bendick, J.
Conrad, R.
Cooper, G.
Cramb, A.
Cunningham, N.
Davignon, J.
Forbes, I.
Gannon, R.
LaFave, R.
McLean, C.
Magee, J.
Reynolds, G.
Roed, E.
Trotter, B.
Vikstrom, J.

JUNE 1980

Atkinson, J.
Bendick, J.
Cunningham, N.
Davignon, J.
Forbes, I.
Gannon, R.
McLean, C.
Magee, J.
Ridinger, A.
Stephens, A.
Vikstrom, J.

JULY 1980

Atkinson, J.
Bendick, J.
Bustin, P.
Caldwell, B.
Cunningham, N.
Forbes, I.
Gannon, R.
McLean, C.
Magee, J.
Ridinger, A.
Roed, E.
Schaller, C.
Stephens, A.
Trotter, B.
Vikstrom, J.

AUGUST 1980

Bendick, J.
Cooper, G.
Cunningham, N.
Forbes, I.
Fraser, J.
Gannon, R.
McLean, C.
Magee, J.
Morrison, D.
Roed, E.
Schaller, C.
Stanley, M.
Vikstrom, J.
Walter, C.

SEPTEMBER 1980

Bendick, J.
Cooper, G.
Forbes, I.
Gannon, R.
McLean, C.
Magee, J.
Morrison, D.
Morrow, C.
Powell, R.
Saunders, K.
Stanley, M.
Vikstrom, J.
Zroback, W.

OCTOBER 1980

Bendick, J.
Cooper, G.
Forbes, I.
Gannon, R.
McLean, C.
Morrow, C.
Ridinger, A.
Roed, E.
Rossiter, F.
Saunders, K.
Steele, D.
Totten, K.
Vikstrom, J.

NOVEMBER 1980

Atkinson, J.
Bendick, J.
Bradley, J.
Cooper, G.
Cunningham, N.
Gannon, R.
McIllfaterick, K.
McLean, C.
Miller, K.
Morrow, C.
Pearce, J.
Roed, E.
Rossiter, F.
Vikstrom, J.

DECEMBER 1980

Cooper, G.
Forbes, I.
Fraser, J.
Gannon, R.
LaFave, R.
Reynolds, G.
Roed, E.
Rossiter, F.
Stanley, M.
Steele, D.
Totten, K.
Vikstrom, J.
Walter, C.

(continued ...)

JUNE 1979

Anderson, D.	Conrad, R.	Kanopski, J.	Schaller, C.
Atkinson, J.	Gannon, R.	McLean, C.	Trotter, B.
Bendick, J.	Harker, G.	Magee, J.	Vikstrom, J.
Cooper, G.	Holland, W.	Pearce, J.	Walders, B.

JULY 1979

Bendick, J.	Gannon, R.	Merry, H.	Vikstrom, J.
Blackmon, D.	James, E.	Roed, E.	
Cunningham, N.	McLean, C.	Schaller, C.	
Forbes, I.	Magee, J.	Totten, K.	

AUGUST 1979

Anderson, A. L.	Cooper, G.	Magee, J.	Vikstrom, J.
Atkinson, J.	Forbes, I.	Pearce, J.	
Bendick, J.	Gannon, R.	Roed, E.	
Blackmon, D.	McLean, C.	Streicher, C.	

SEPTEMBER 1979

Anderson, D.	Cooper, G.	Holland, W.	Pearce, J.
Bendick, J.	Forbes, I.	LaFave, R.	Streicher, C.
Caldwell, B.	Gannon, R.	Magee, J.	Vikstrom, J.

OCTOBER 1979

Anderson, D.	Cunningham, N.	Holland, W.	Steele, D.
Bendick, J.	Fiedler, B.	McLean, J.	Vikstrom, J.
Bradley, J.	Forbes, I.	Pearce, J.	
Cooper, G.	Gannon, R.	Roed, E.	

NOVEMBER 1979

Bendick, J.	Forbes, I.	LaFave, R.	Roed, E.
Cooper, G.	Gannon, R.	McLean, C.	Vikstrom, J.
Fiedler, B.	Green, E.	Magee, J.	

DECEMBER 1979

Atkinson, J.	Forbes, I.	Magee, J.	Roed, E.
Caldwell, B.	Gannon, R.	Morrow, C.	Schaller, C.
Cooper, G.	McLean, C.	Pearce, J.	Vikstrom, J.
Cunningham, N.			

JANUARY 1980

Atkinson, J.	Crookes, E.	McBride, J.	Pearce, J.
Bendick, J.	Forbes, I.	McLean, C.	Rolls, K.
Cooper, G.	Gannon, R.	Magee, J.	Vikstrom, J.

FEBRUARY 1980

Atkinson, J.	Forbes, I.	McLean, C.	Rolls, K.
Bendick, J.	Fullerton, W.	Magee, J.	Vikstrom, J.
Cooper, G.	Gannon, R.	Merry, H.	
Cramb, A.	Lewis, D.	Pearce, J.	

MARCH 1980

Anderson, G.	Hughes, R.	Morrow, C.	Roed, E.
Atkinson, J.	Lewis, D.	Nystrom, B.	Rolls, K.
Bone, L.	McLean, C.	Pearce, J.	Stephens, A.
Forbes, I.	Magee, J.	Reid, W.	Vikstrom, J.
Gannon, R.	Merry, H.	Ridinger, A.	

(continued ...)

SHOAL ISLAND DRY LAND SORT

F.S. SCALER ASSIGNMENTS

JULY 1978 - OCTOBER 1981

JULY 1978

Atkinson, J.	Fiedler, B.	Pearce, J.	Trotter, B.
Bendick, J.	Gannon, R.	Roed, E.	Vikstrom, J.

AUGUST 1978

Anderson, G.	Green, E.	Nystrom, B.	Trotter, B.
Bendick, J.	McIllfaterick, K.	Roed, E.	Vikstrom, J.
Fiedler, B.			

SEPTEMBER 1978

Anderson, G.	Caldwell, B.	Nystrom, B.	Vikstrom, J.
Atkinson, J.	Gannon, R.	Pearce, J.	
Bendick, J.	McIllfaterick, K.	Roed, E.	
Bradley, D.	Major, M.	Streicher, C.	

OCTOBER 1978

Atkinson, J.	Gannon, R.	Magee, J.	Roed, E.
Bendick, J.	McLean, C.	Pearce, J.	Vikstrom, J.
Cooper, G.			

NOVEMBER 1978

Atkinson, J.	Gannon, R.	Magee, J.	Roed, E.
Bendick, J.	McLean, C.	Pearce, J.	Vikstrom, J.
Cooper, G.			

DECEMBER 1978

Atkinson, J.	Cooper, G.	Magee, J.	Roed, E.
Bendick, J.	Gannon, R.	Morrow, C.	Vikstrom, J.
Burton, T.	McLean, C.	Nystrom, B.	

JANUARY 1979

Bendick, J.	McIllfaterick, K.	Pearce, J.	Vikstrom, J.
Cooper, G.	McLean, C.	Roed, E.	
Gannon, R.	Magee, J.	Steele, D.	

FEBRUARY 1979

Atkinson, J.	Fiedler, B.	Magee, J.	Steele, D.
Bendick, J.	Gannon, R.	Pearce, J.	Stephens, A.
Cooper, G.	McLean, C.	Roed, E.	Vikstrom, J.

MARCH 1979

Cooper, G.	Fiedler, B.	Gannon, R.	Magee, J.

APRIL 1979

Atkinson, J.	Gannon, R.	Pearce, J.	Streicher, C.
Bendick, J.	McIllfaterick, K.	Roed, E.	Vikstrom, J.
Cooper, G.	Magee, J.	Stephens, A.	

MAY 1979

Anderson, D.	Cooper, G.	Magee, J.	Streicher, C.
Atkinson, J.	Gannon, R.	Pearce, J.	Vikstrom, J.
Caldwell, B.	McLean, C.	Roed, E.	

(continued ...)

IN THE MATTER OF AN INQUIRY

INTO LOG SCALING AT SHOAL ISLAND

CONDUCTED BY MR. DONALD T. GRANT

SUBMISSIONS OF THE CONTRACTORS ARISING FROM THE SECOND REPORT OF DR. A. J. PETKAU DATED MAY 13TH, 1985

Prepared by:

MULHOLLAND WEBSTER
Barristers and Solicitors
#201 - 6300 No. 3 Road
Richmond, B.C.
V6Y 2B3
273-3741

In the report dated May 13th, 1985, Dr. Petkau appears to have focused on only two areas:

A. An assumption that the September 1 - 4, 1981 scale is the only reliable data presented to Mr. Grant and that given a consistency assumption with respect to scaling procedures it will provide the most reliable assessment of the magnitude of the problem of scaling at Shoal Island

- and -

B. An assumption that the samples used in establishing the SYTLAV factor are not random samples and as a result cannot be used to establish confidence limits for the SYTLAV factor.

1. With respect to point A, we submit the following:

"A. An assumption that the September 1 - 4, 1981, scale is the only reliable data presented to Mr. Grant and that given a consistency assumption with respect to scaling procedures it will provide the most reliable assessment of the magnitude of the problem of scaling at Shoal Island."

1.1 The September 1 - 4 check scale examined only the scale variation between three groups of scalers because no bench mark was established i.e. there was no official count of the logs placed before the scalers for scaling. Because there was no "bench mark" one does not know if all the logs delivered, and therefore all the volume delivered, was scaled when placed before the scalers. A check scale has little value, if any, unless there is verifiable evidence that all volume delivered in the boom units being check scaled was in fact scaled.

1.2 It is amply demonstrated in the material placed before Mr. Grant that the September 1 - 4, 1981, scale was not

conducted under the normal procedural environment that existed during the period under review.

1.3 Dr. Petkau asks "is there any reason to anticipate the suggested substantial underscales by Shadforth and Woodrow?". The reason is that both Shadforth and Woodrow acknowledge that they missed logs.

1.4 It appears that Dr. Petkau relies on the September 1 - 4, 1981, scale solely because he felt there was less likelihood that the scalers suspected any problem and thus the scaling would be carried out under conditions approximating normal operating conditions.

Nothing could be further from the truth because in that scale:

(a) scaling was done on a boom by boom basis;

(b) the pace of log flow was reduced from 2661 to 1907 logs per shift;

(c) tallies were closed daily;

(d) computation was done immediately and professionally.

1.5 From the foregoing, it follows that no reliance whatsoever can be placed on the September 1 - 4, 1981, scale as a basis for determining the quantum of underscale.

1.6 The consistency assumption as to measurement process is not proven. However, there is, a consistency in the 15.5% error created by the in-built procedures at Shoal Island that violated Part 6 of the Forest Act as evidenced by Laing's Tables - and this consistency is not assumed.

With respect to point B:

"B. An assumption that the samples used in establishing the SYTLAV factor are not random samples and as a result cannot be used to establish confidence limits for the SYTLAV factor."

2. The samples used in establishing the SYTLAV factor are drawn from the total population - which is the

whole of T.F.L. 17. As Mr. Grant will know, these samples came from logging areas in different locations within the T.F.L. which ensure that the data is sufficiently random to validate the standard statistical tests and confidence limits.

For further comments see Crawford E. Laing Ltd. Report attached as an Appendix hereto.

3.1 One must question Dr. Petkau's logic - he is prepared to rely on a seriously flawed check scale - September 1 - 4, 1981, - a single tiny sample - and an unproven and unprovable consistency assumption to determine the quantum of underscale. On the other hand, although he marvels at the consistency of SYTLAV through 1982, 1983 and 1984, he rejects that visible consistency and the various demonstrations of a consistent 15.5% underscale of the volume of logs delivered.

3.2 In other words, SYTLAV, which was developed from a wealth of data is ignored because it does not meet Dr. Petkau's criteria of a simple random sample although Laing's Tables in Appendix B are derived

from simple random samples.

4. We assume from the context of Dr. Petkau's reply that in the absence of comment or disagreement he agrees with the data submitted by the Contractors on Whittaker-Burdge, the July 9th - 12th Shadforth scale and other related matters.

5. As noted by Mr. Clancy, Dr. Petkau has wrongly assumed that the Ministry of Forests' check scales "... had been carried out . . . without any untoward results."

6.1 There is, of course, an abundance of available information demonstrating the practical use and reliability placed upon SYTLAV within the Coastal Forest Industry. This unfortunately has not been made available to Dr. Petkau. You, Mr. Grant, are well aware that Crown stumpage on log losses has been settled on the basis of SYTLAV - if not, the Contractors can document same for you and hereby seek leave to file that evidence.

6.2 In the past the Crown has used SYTLAV to determine stumpage payable where logs have been processed or lost without first being scaled. There

is a lack of consistency when the Crown rejects this well accepted methodology to determine the quantum of underscale at Shoal Island. Is this rejection engendered because of the possibility of the liability of the Crown to the Contractors for the losses they have suffered?

6.3 Mr. Grant must direct his mind to all the data presented by the Contractors and employ the resources of the Ministry to confirm that data through other sources. Further, he must obtain and consider all other relevant evidence which may be available.

7. Mr. Clancy's May 17th, 1985 letter and related attachments is confirmation of what has long been evident. Shoal Island was not monitored by professional check scales that would determine what was delivered in the inflow booms. The admission on behalf of the Forest Service is that it is probable that only one check scale was performed. This one check scale appears to be a check of an inexperienced scaler and no weight can be given to it.

ALL OF WHICH IS RESPECTFULLY SUBMITTED.

R. BRIAN WEBSTER

June 10th, 1985

APPENDIX

CEL GROUP

APPENDIX A

1. Petkau I, page 61;
Petkau II, item 1:

We are in agreement with Dr. Petkau that the relevance of the check scales of 151 outgoing booms, cited by B.C.F.P., has not been established, and we agree that Mr. Grant should not put any reliance on them.

2. Petkau I, page 86;
Petkau II, item 4:

Dr. Petkau now confirms that the conclusion to be reached from the check scales in September and October 1981 is that "logs could be missed with the procedures in use by the Ministry of Forests' scalers at Shoal Island". This is a direct quotation from page 7 of the Ministry of Forests' own brief. On page 87, Dr. Petkau goes on to say (in the same paragraph) - "It follows that there was a volume of timber unscaled; namely the volume corresponding to the missed logs". This is a reasonable, and somewhat self-evident, conclusion. We commend it to Mr. Grant in his consideration of this matter.

3. Petkau I, pages 60-61 and 88-89;
Petkau II, item 5:

Dr. Petkau confirms that "the problem appeared to be in the scaling procedure, and not the scaling itself". This is the Contractors' conclusion exactly, and the distinction is important. Individual scalers may scale each log they see accurately, but the surrounding conditions may be such that they - or the computer operator - may miss logs.

APPENDIX A (Contd.)

4. Petkau II, item 8;

CEL Group I, pages 5 and 27:

Dr. Petkau now clearly agrees that Mr. Grant should be cautioned that "all possible relevant information should be examined carefully before attempting an assessment of the magnitude of the problem". The Contractors have provided Mr. Grant with a large volume of relevant data, on which to base his findings. As we have said in our Reports, Mr. Grant has access to the necessary resources to audit such data thoroughly.

5. Petkau I, pages 14 - 15;
Petkau II, item A.2;

Kyuquot, page 16:

The traditional industry use of a 6.0% adjustment for water shrinkage is not really relevant to the determination of underscale at Shoal Island during the period under dispute, for the following reasons:

(a) Shoal Island was a dryland sort;

(b) the SYTLAV Factor used to determine the quantum of underscale is based primarily on the data from later scaling at Shoal Island from 1982 to 1984 - again a dryland sort;

(c) the data from water scaling before the start-up of Shoal Island was included to confirm the consistency of scaling results when scaling procedures were strictly in accordance with Part 6.

APPENDIX A (Contd.)

6. Petkau II, item B.1.2;

CEL Group, page 8, Table 3.1;

Contractors, page 4 of Text and Appendix II, page 12:

There is no evidence whatsoever, - and Dr. Petkau certainly has not produced any, - to support his suggestion that it was the expected volumes obtained by using the Truck Load Average Factors that were too large. All the evidence points to the fact that logs were consistently missed, even by Shadforth and Woodrow, but the numbers are unknown. So Mr. Grant will have to rely on the Truck Load Average method, with its proven history of stability and reliability, to determine the quantum of underscale.

7. Petkau I, pages 18-20 and 35-36;
Petkau II, items B.1.3 and B.1.4;

CEL Group, Appendices A and B:

Credit must be given to Dr. Petkau for helping to correct the weaknesses in both the Thomson report and the earlier CEL Ltd. Report. These were indeed corrected in the CEL Group Report cited, and Dr. Petkau demonstrates a clear understanding of these calculations, and an acceptance of the conclusions - up to the use of the standard deviation to measure variability.

His second paragraph is a recapitulation of some rather elementary statistics, and presumably indicates his agreement with the new calculations.

His difficulty is with the use of the "standard error of the mean", which he agrees is the standard deviation divided by the square root of the number of observations. While a perceived lack of randomness could cause difficulties in the pure academic area of Probability Theory, for estimating unknown populations from small samples, the standard error as so calculated is nevertheless a useful COMPARATIVE measurement of variability between samples (whether random or not) of different sizes.

APPENDIX A (Contd.)

To explain - it is not easy to draw conclusions as to the variability of two averages, one drawn from a sample of 7 observations and one drawn from 100 observations, merely by reciting the standard deviations. However, if each statistic is divided by the square root of the number of observations, the two answers can be compared directly - whether or not they are called "standard error of the mean", and whether or not they are used to develop confidence intervals.

Be that as it may, Dr. Petkau still does not seem to understand that the whole population being tested is the timber harvested from T.F.L.17. All the data from Sallie Creek in 1982 tells us all about the booms from Sallie Creek in 1982 - without any uncertainty, of course, - but this was not the only data used to develop the SYTLAV Factor.

The data in Table L is also drawn from Knight Inlet, which is another outlet for timber from T.F.L.17. Both of these are supplied with logs from the several locations where cutting takes place at different times of the year, so each year's production includes some logs from each 'opening'. So the various truck loads delivered to 'camp', and thence to Shoal Island, are in fact random samples from the whole Tree Farm Licence.

This gives further support to the proposition that the data used to develop the SYTLAV Factor is indeed produced by a "Simple Random Sampling Design", and although there is no 'replacement', there is, for statistical purposes, an 'infinite' population, which gives the same effect insofar as the validity of the confidence levels is concerned.

APPENDIX A (Contd.)

Furthermore, not only is the 1982 data from Sallie Creek a random sample from the greater population of the total production from T.F.L.17 from 1977 to 1984, but all the data used in Table L from 1982 to 1984 inclusive, - which included 94 observations, - is a random sample from T.F.L.17. Precisely because it is a large sample, useful conclusions can indeed be drawn about the stability of the Truck Load Average Volume, and its relevance in determining the quantum of underscale during the period under dispute.

Whether or not these can be expressed in terms of confidence limits, due to perceived limitations in the pure academic use of Probability Theory, it is obvious to any observer, - and Dr. Petkau seems to agree, - that there is a remarkable stability and consistency in the traditional Truck Load Average Factor used by competent Contractors, - and which is now referred to as the SYTLAV Factor, - and it has been, and can be, used as a test of whether scaling is being done properly in accordance with Part 6 of the Forest Act.

To quote from a textbook on "Probability with Statistical Applications" (Mosteller, Rourke, and Thomas), in dealing with the Monte Carlo technique, - 'The numerical answer obtained from averaging, or otherwise analyzing, the many results is the one used for practical work.'

In Appendix B of the CEL Group response, many random samples of different sizes were drawn from the 94 observations in Table L (a known sub-population), to demonstrate the confidence limits for different sizes of random sample. The conclusion was that to obtain a level of confidence better than that used for normal scaling (i.e. +/- 3.0%), "it is necessary to take a sample of more than 10 observations." (CEL Group, Appendix B, page 1).

In fact all 94 observations in Table L can be used to develop the SYTLAV Factor on which Mr. Grant can base his estimate of the true volume harvested and delivered.

APPENDIX A (Contd.)

8. Petkau II, item B.1.5;

CEL Group, page 18 and Table 5.2, page 20:

This adjustment for low stake loading was based on empirical data, and an analysis of the loading constraints for this type of truck. Its relevance is confirmed by the results from two different operators (Kyuquot and Dougan), using the same truck in different locations.

9. Petkau II, item B.2.1;

Contractors, Appendix II, page 3;

CEL Group, Appendix A:

Dr. Petkau still fails to understand the fundamental position of the Contractors, - namely that if scaling is done properly under Part 6 of the Forest Act, they have to accept its accuracy, and will do so - provided their own tests, using the Truck Load Average method, do not indicate any problems.

Tables Q and L in Appendix A of the CEL Group response, indicate a consistent correspondence with the expected results using the Truck Load Average method, - both before (Table Q), and after (Table L), the period in dispute, - and a CONSISTENT disparity from the expected result during the period in dispute (Table W).

Therefore, the Contractors accept the scaling results before and after the said period as accurate, and claim that the results for the period in dispute, - however consistent within themselves, - are nevertheless inaccurate because they indicate a significant discrepancy from the results expected and obtained when scaling is done properly under Part 6.

APPENDIX A (Contd.)

10. Petkau II, item B.2.2;

CEL Group, Appendix A;

Contractors, Appendix II, page 4A, paragraph 4.0
and Text, page 6, paragraph 9.2:

As explained in (9) above, Dr. Petkau has fallen into the same trap as others by failing to recognize that consistency during the period under dispute is not a guarantee of accuracy. What it does confirm is the in-built structural and procedural problems at Shoal Island up to October 1981, - which resulted in a consistent underscale of 15.5%.

However, Dr. Petkau appears not to recognize the inherent lack of homogeneity in the data, between scaling during the period in dispute, - which was not done properly under Part 6, - and which therefore should not be confused with the results from proper scaling under Part 6, after the said period.

There is a different level of consistency between these two periods, and the check scale of September 1 to 4, 1981 did not belong to either family. This is amply demonstrated in the Tables in the CEL Group response, and all that needs to be repeated here is that the level of the "consistency assumption" is different for the period in dispute, from that for the period after scaling procedures were corrected by the Ministry of Forests, in October 1981.

APPENDIX A (Contd.)

11. Petkau II, item B.2.3;

Contractors, Appendix II, pages 9-12:

Dr. Petkau's problem would perhaps be resolved if Hutching's question had been rephrased - "Why does the data provided by the Company indicate less underscale than the data provided by the Contractors?". Some of the answers are to be found in pages 11 and 12 of Appendix II of the Conractors brief (paragraphs 3.1(c) and 3.2). Mr. Grant could possibly find the full answer to the question if he were to audit all the data.

12. Petkau II, item B.3.1;

Contractors, Appendix III, pages 1-3:

Dr. Petkau has evidently missed the whole point of the Shadforth check scale on July 9-10, 1981. To quote from paragraph 3 on page 1 of Appendix III (Contractors), "The objective was to scale 'S' truck loads, so Traer & Mahood could confirm or otherwise its historic yearly load average for 'S' trucks, and in addition scale 'L' trucks for which Traer & Mahood had no previous experience ...".

There was at that time no possibility of comparing Shadforth's results with the results obtained by the official scalers at Shoal Island, because the latter did not then scale on a bundle by bundle basis.

The Shadforth scale of July 9-10, 1981 speaks eloquently to confirm an underscale of 15.5% to 16.0%. The degree of randomness does not mute the eloquence.

APPENDIX A (Contd.)

13. Petkau II, item B.3.2;

Shadforth Data Sheets;

CEL Group, pages 1 and 2, Section 1:

Dr. Petkau should now recognize what has been obvious throughout, and was pointed out in the CEL Group response, that the integrity of the Truck Load bundle was not maintained through the scaling procedure at Shoal Island during the period in dispute, - so the only auditable entity that Mr. Grant can use is the boom (or group of booms). Only at this level can he have access to suitable data, - which is still available, - to determine the volume harvested and delivered, and compare it with the scaled volume.

14. Petkau II, item B.4.1;

Contractors, Text, page 8:

The use of the word "random" - which seems to upset Dr. Petkau so much - is not important to the case made by the Contractors on page 8. If the word "random" were omitted on the one occasion it is used on this page, the argument of the Contractors would still be as strong as ever - namely that Mr. Grant can and should use the Truck Load Average method, and the data provided by the Contractors, after thoroughly auditing it, to assess the true volume harvested and delivered during the period in dispute.

Even if references to confidence levels are omitted, the consistency of the SYTLAV/CEL factor when scaling is done properly under Part 6 - as evidenced by the mean and standard deviations in the Tables in Appendix A of the CEL Group response, and which Dr. Petkau now accepts - should give Mr. Grant enough confidence to use it to determine the quantum of underscale during the period in dispute.

Lawson & McIntosh

Barristers and Solicitors

Q.C. (1955) OSCAR F. LUNDELL, Q.C. (1982)
DAVID A. LAWSON (1975)

Q.C. JOHN M. TENNANT
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May 30, 1985

DELIVERED

Macaulay, McColl
Barristers & Solicitors
1540 - 700 West Georgia Street
VANCOUVER, B.C.
V7Y 1C6

Attention: John K. Irving, Esq.

Dear Sirs:

Re: Shoal Island - Dr. Petkau's Response

Thank you for your letter of May 27, 1985 attaching Dr. Petkau's response of May 13, 1985 and various other documents.

British Columbia Forest Products Limited does not wish to make a submission on the second report from Dr. Petkau.

The only observation which British Columbia Forest Products Limited wishes to make with respect to the other material enclosed with your letter is to note that the check scale of Camp Boom No. P.A.S.-666-K indicates that the original scale represents an overscale of 16.35%.

Yours truly,

B J Wallace

Brian J. Wallace

BJW/sbp
c.c. Donald L. Clancy, Esq.,
Ministry of the Attorney General;
D. Barry Kirkham, Esq.,
Owen, Bird for Kyuquot Logging Ltd.;
R. Brian Webster, Esq.,
Mulholland, Webster for Traer & Mahood Contractors Ltd. et al;
Ms. Linda Baker,
for the B.C.G.E.U.

OWEN, BIRD

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DAVID G FREDRICKSEN
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JONATHAN B FESTINGER
JAMES A HALL
JAMES BRENNAN

D ALEXANDER FARAC
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TOBIN S ROBBINS
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June 7th, 1985

DELIVERED VIA COURIER

Macaulay, McColl
Barristers and Solicitors
Suite 1650 - 700 West Georgia
VANCOUVER, B.C.
V7Y 1C6

Attention: Mr. John K. Irving

Dear Sirs:

Re: British Columbia Forest Products Limited
- Grant Inquiry - Your File No. 339-001

Thank you for your letter of May 27, 1985 and enclosures.

Kyuquot Logging Ltd. does not wish to make a submission with respect to Dr. Petkau's second report.

Kyuquot Logging Ltd. agrees strongly with Dr. Petkau's comment at page 3 that "all possible relevant information be examined carefully before attempting an assessment of the magnitude of the problem." Kyuquot Logging Ltd. trusts that Mr. Grant and/or Dr. Petkau will examine all such relevant information, including the working papers for the Whittaker-Burdge report, the records and data of the contractors and B.C.F.P., information concerning sizes of trucks in use for those bundles under consideration during the Whittaker-Burdge test period, etc. An examination of such data might well assist in answering Mr. Hutching's question "Why are the company operations underscaled less than the contractors?"

Yours very truly,

OWEN, BIRD

Gretchen H. Cleveland

GHC/bd
cc: Lawson, Lundell (Attn: J. E. Gouge)
The Ministry of the Attorney General (Attn: D.L. Clancy)
Mulholland Webster (Attn: R.B. Webster)
B.C. Government Employees Union (Attn: Linda Baker)
Kyuquot Logging Ltd. (Attn: Donald Percy)